

Academic Program Description Form



University Name: Al-Karkh University of Science

Faculty/Institute: College of Engineering

Scientific Department: Artificial Intelligence and Robotics

Engineering

Academic or Professional Program Name: Bachelor of AI and Robotics
Engineering

Final Certificate Name: Bachelor in AI and Robotics Engineering Science

Academic System: Bologna Process

Description Preparation Date: 28/6/2026

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Signature:

Head of Department Name:
Dr. Zaid Shakir Kadhim

Date: 2/7/2026

Signature:

Scientific Associate Name:
Rafa Abbas Hasan

Date: 2/7/2026

The file is checked by: Quality Assurance and Academic Accreditation Section

Director of Quality Assurance: Asst. Prof. Dr. Maad A. Hussein

Date:

Signature:



Approval of the Dean: Prof. Dr. Jumaa Salman Chiad

Al-karkh University of Science

جامعة الكرخ للعلوم



*First Cycle – Four Levels- 240 ECTS - Bachelor's degree (B.Sc.)
– Artificial Intelligence & Robotics Engineering*

الدورة الاولى – اربع سنوات- بكالوريوس هندسة - هندسة الذكاء الاصطناعي والانسان
الالي- 240 وحدة اوروبية



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1. Mission & Vision Statement

رؤية ورسالة القسم العلمي

Vision Statement

The vision of the Department of Artificial Intelligence and Robotics Engineering is to be a global leader and reference point in the field of artificial intelligence and advanced robotics applications, contributing to technological development to serve society and advance humanity. This vision aims to support innovation and scientific research, and to provide an interactive learning environment that fosters deep learning and practical applications in future technology fields. This includes:

1. Academic and Research Excellence:

- The department aims to promote academic and research excellence by supporting students and researchers in exploring the fields of artificial intelligence and robotics.
- The department strives to contribute to producing pioneering research in areas such as machine learning, and the applications of artificial intelligence in industry, medicine, agriculture, and other sectors.

2. Developing Future Technologies:

- The department works on developing new technologies and systems in the fields of artificial intelligence and robotics, supporting global technological advancement.
- The focus is on developing intelligent robots that utilize technologies such as machine learning, neural networks, and social robotics.

3. Deep Learning and Practical Applications:

- The department seeks to provide a learning environment that enables students to understand modern technologies such as deep learning and apply them to solving real-world problems. •

The department encourages applied projects that allow students to interact with artificial intelligence and robotics technologies in practical contexts.

4. Leadership and Innovation:

- The department supports leadership and innovation by providing support to students and researchers to transform their ideas into applicable technological projects.
- The department strives to guide students toward developing creative solutions and innovative technologies in the fields of robotics and artificial intelligence.

5. Collaboration with Industry and the Community:

- The department seeks to build partnerships with companies and industrial institutions to exchange knowledge and expertise and provide training and employment opportunities for students.
- The department also aims to engage with the local community by organizing events and workshops to introduce artificial intelligence and robotics technologies.

The vision of the Department of Artificial Intelligence and Robotics Engineering is to achieve technological and scientific advancement in these vital fields. By promoting education, research, and practical applications, the department can effectively contribute to the development of technologies that transform lives and support social and economic progress.

رؤية قسم هندسة الذكاء الاصطناعي والإنسان الآلي تتمثل في أن يكون رائدًا ومرجعًا عالميًا في مجال الذكاء الاصطناعي وتطبيقات الروبوتات المتقدمة، مساهمًا في تطوير التكنولوجيا لخدمة المجتمع وتحقيق التقدم البشري. تهدف الرؤية إلى دعم الابتكار والبحث العلمي، وتوفير بيئة تعليمية تفاعلية تعزز التعلم العميق والتطبيقات العملية في مجالات التكنولوجيا المستقبلية. وتشمل ما يلي:

1- التفوق الأكاديمي والبحثي:

- يهدف القسم إلى تعزيز التفوق الأكاديمي والبحثي من خلال دعم الطلاب والباحثين في استكشاف مجالات الذكاء الاصطناعي والإنسان الآلي.
- يسعى القسم للمساهمة في إنتاج البحوث الرائدة في مجالات مثل التعلم الآلي، وتطبيقات الذكاء الصناعي في الصناعة والطب والزراعة وغيرها.

2- تطوير التقنيات المستقبلية:

- يعمل القسم على تطوير تقنيات وأنظمة جديدة في مجالات الذكاء الاصطناعي والإنسان الآلي، مما يدعم التقدم التكنولوجي العالمي.
- يتمثل التركيز في تطوير الروبوتات الذكية التي تستخدم تقنيات مثل تعلم الآلة، والشبكات العصبية، والروبوتات الاجتماعية.

3- التعلم العميق والتطبيقات العملية:

- يسعى القسم لتوفير بيئة تعليمية تمكن الطلاب من فهم التقنيات الحديثة مثل التعلم العميق وتطبيقها في حل المشاكل الواقعية.
- يشجع القسم على تنفيذ مشاريع تطبيقية تتيح للطلاب التفاعل مع تقنيات الذكاء الاصطناعي والإنسان الآلي في سياقات عملية.

4- الريادة والابتكار:

- يدعم القسم الريادة والابتكار من خلال توفير دعم للطلاب والباحثين لتحويل أفكارهم إلى مشاريع تقنية قابلة للتطبيق.
- يسعى القسم إلى توجيه الطلاب نحو تطوير حلول إبداعية وتقنيات مبتكرة في مجالات الروبوتات والذكاء الاصطناعي.

5- التعاون مع الصناعة والمجتمع:

- يسعى القسم إلى بناء شراكات مع الشركات والمؤسسات الصناعية لتبادل المعرفة والخبرات، وتوفير فرص التدريب والتوظيف للطلاب.
- يسعى القسم أيضًا إلى الانخراط مع المجتمع المحلي من خلال إقامة فعاليات وورش عمل تعريفية بتقنيات الذكاء الاصطناعي والإنسان الآلي.

Mission Statement

- **Preparing qualified graduates:** The department aims to graduate students with the knowledge and skills necessary to work in the fields of artificial intelligence and robotics, including the design and development of AI systems, robotics construction, and the integration of AI and robotics technologies into various applications.
- **Providing high-quality education:** The department strives to provide high-quality education to its students using modern curricula, the provision of state-of-the-art educational facilities, and inviting experts in the field to serve as lecturers.
- **Enhancing research skills:** The department focuses on enhancing the research skills of its students by encouraging them to participate in research projects, publish their scientific papers in specialized journals, and attend scientific conferences.
- **Developing new technologies:** The department seeks to develop new technologies in the fields of artificial intelligence and robotics through conducting rigorous scientific research.
- **Problem-solving:** The department aims to solve real-world problems facing societies through the application of AI and robotics technologies.
- **Contributing to knowledge:** The department seeks to contribute to scientific knowledge by publishing the results of its research in specialized journals and presenting them to the scientific community.
- **Knowledge Transfer:** The department strives to transfer knowledge and skills related to artificial intelligence and robotics to the community through educational and training programs, workshops, and conferences.
- **Application Development:** The department aims to develop smart technological applications that meet the needs of the community in various fields, such as healthcare, education, agriculture, and industry.
- **Fostering Innovation:** The department seeks to promote a culture of innovation in the community by encouraging entrepreneurs to use artificial intelligence and robotics technologies in their projects.

2. Program Specification

Programme code:	BSc-AIR	ECTS	240
Duration:	4 levels, 8 Semesters	Method of Attendance:	Full Time

Artificial Intelligence and Robotics Engineering is a broad and rapidly evolving discipline, integrating computing, electronics, control systems, and intelligent decision-making. With a diverse and multidisciplinary teaching team, the College of Engineering is well positioned to deliver a comprehensive programme that reflects both the theoretical foundations and practical applications of intelligent systems. The emphasis of the programme is on the intelligent system, encompassing data, algorithms, hardware, and autonomous behavior within real-world environments.

The programme appeals to students for different reasons: for some, the breadth of the discipline and its wide-ranging applications is particularly attractive, while for others it represents a pathway toward specialization in advanced areas such as machine learning, robotics, autonomous systems, and

intelligent control. Students are provided with a strong foundational year that allows informed progression into specialized modules as their interests and strengths develop.

Level 1 introduces students to the fundamental principles of computer science, mathematics, electronics, and engineering thinking that underpin all areas of artificial intelligence and robotics. This level is designed to support progression into all programmes within the AI and intelligent systems domain.

At Level 2, programme-specific core topics are introduced, including data structures, digital systems, control fundamentals, and introductory artificial intelligence, preparing students for research-informed and application-oriented specialist modules at Levels 3 and 4. Graduates of the programme are therefore trained to understand the strong relationship between research, innovation, and engineering practice, in alignment with the mission of the University and the College.

From Levels 2 to 4, students can choose a significant proportion of their modules, provided that their selection reflects the integrated nature of intelligent systems—from algorithms and data processing, through hardware and embedded systems, to autonomous agents and robotic platforms. This flexibility enables students to develop individualized academic pathways while maintaining the breadth of knowledge expected of a graduate in AI and Robotics Engineering. Module choices are made with guidance from personal tutors to ensure academic coherence and progression.

A strong research and innovation ethos is embedded from the outset through laboratory work, programming assignments, design projects, research seminars, and tutorials. Practical components are integrated within lecture-based modules and reinforced through dedicated laboratory courses. At Level 4, all students undertake an independent graduation project, which may involve software development, data analysis, hardware implementation, simulation, or experimental research in artificial intelligence or robotics.

Academic tutorials are conducted during Levels 1 and 2 with the same academic tutor, who also serves as the student's personal tutor, ensuring continuity of academic guidance and skills development. These tutorials include structured workshops focusing on essential engineering skills such as technical writing, research methods, teamwork, and professional presentation, followed by assessed activities within a subject-specific context.

The programme also offers opportunities for industrial training and international study, subject to availability. Individual student needs and career goals are discussed with academic advisors and accommodated wherever possible, supporting graduates in preparing for professional practice, postgraduate study, or innovation-driven careers in AI and robotics.

يُعدّ تخصص الذكاء الاصطناعي وهندسة الروبوتات مجالاً واسعاً وسريع التطور، يدمج الحوسبة والإلكترونيات وأنظمة التحكم واتخاذ القرارات الذكية. وبفضل فريق تدريسي متنوع ومتعدد التخصصات، تتمتع كلية الهندسة بمكانة مميزة لتقديم برنامج شامل يعكس الأسس النظرية والتطبيقات العملية للأنظمة الذكية. ويركز البرنامج على النظام الذكي ككل، بما يشمل البيانات والخوارزميات والمكونات المادية والسلوك المستقل في بيئات العالم الحقيقي.

يجذب البرنامج الطلاب لأسباب مختلفة: فبالنسبة للبعض، يُعدّ اتساع نطاق التخصص وتطبيقاته المتعددة عامل جذب خاص، بينما يمثل للبعض الآخر مسارًا نحو التخصص في مجالات متقدمة مثل التعلم الآلي والروبوتات والأنظمة المستقلة والتحكم الذكي. ويُوفّر البرنامج للطلاب سنة تأسيسية قوية تُمكنهم من التقدم بوعي إلى وحدات دراسية متخصصة مع تطور اهتماماتهم وقدراتهم. يُعرّف المستوى الأول الطلاب بالمبادئ الأساسية لعلوم الحاسوب والرياضيات والإلكترونيات والتفكير الهندسي التي تُشكّل أساس جميع مجالات الذكاء الاصطناعي والروبوتات. وقد صُمم هذا المستوى لدعم التقدم إلى جميع البرامج ضمن مجال الذكاء الاصطناعي والأنظمة الذكية.

في المستوى الثاني، تُقدّم مواضيع أساسية خاصة بالبرنامج، تشمل هياكل البيانات، والأنظمة الرقمية، وأساسيات التحكم، ومقدمة في الذكاء الاصطناعي، مما يُهيئ الطلاب لوحدة تخصصية قائمة على البحث العلمي وموجهة نحو التطبيق في المستويين الثالث والرابع. وبذلك، يُدرّب خريجو البرنامج على فهم العلاقة الوثيقة بين البحث والابتكار والممارسة الهندسية، بما يتماشى مع رسالة الجامعة والكلية.

من المستوى الثاني إلى الرابع، يُتاح للطلاب اختيار نسبة كبيرة من وحداتهم الدراسية، شريطة أن يعكس اختيارهم الطبيعة التكاملية للأنظمة الذكية - بدءًا من الخوارزميات ومعالجة البيانات، مرورًا بالأجهزة والأنظمة المدمجة، وصولًا إلى الأنظمة المستقلة والمنصات الروبوتية. تُمكن هذه المرونة الطلاب من تطوير مسارات أكاديمية فردية مع الحفاظ على اتساع المعرفة المتوقعة من خريج هندسة الذكاء الاصطناعي والروبوتات. ويتم اختيار الوحدات الدراسية بتوجيه من المرشدين الأكاديميين لضمان التماسك الأكاديمي والتقدم المستمر.

يتم غرس روح البحث والابتكار القوية منذ البداية من خلال العمل المخبري، ومهام البرمجة، ومشاريع التصميم، والندوات البحثية، والدروس التطبيقية. تُدمج المكونات العملية ضمن المقررات الدراسية القائمة على المحاضرات، وتُعزز من خلال دورات معملية متخصصة. في المستوى الرابع، يُنجز جميع الطلاب مشروع تخرج مستقل، قد يشمل تطوير البرمجيات، أو تحليل البيانات، أو تنفيذ الأجهزة، أو المحاكاة، أو البحث التجريبي في مجال الذكاء الاصطناعي أو الروبوتات.

تُعدّ جلسات إرشادية أكاديمية خلال المستويين الأول والثاني مع المرشد الأكاديمي، الذي يعمل أيضًا كمرشد شخصي للطلاب، مما يضمن استمرارية التوجيه الأكاديمي وتنمية المهارات. تتضمن هذه الجلسات ورش عمل منظمة تركز على مهارات هندسية أساسية مثل الكتابة التقنية، ومنهجيات البحث، والعمل الجماعي، والعرض التقديمي الاحترافي، تليها أنشطة تقييمية ضمن سياق تخصصي محدد.

يوفر البرنامج أيضًا فرصًا للتدريب الصناعي والدراسة الدولية، رهنًا بتوافرها. تُناقش احتياجات الطلاب الفردية وأهدافهم المهنية مع المرشدين الأكاديميين، وتُلَبّى قدر الإمكان، لدعم الخريجين في الاستعداد للممارسة المهنية، أو الدراسات العليا، أو الوظائف القائمة على الابتكار في مجال الذكاء الاصطناعي والروبوتات.

3. Program Goals

1. Providing Outstanding Educational Programs: Offering high-quality educational programs in the fields of artificial intelligence and robotics is a primary objective. The department aims to train and equip students with advanced technical skills and in-depth knowledge in areas such as machine learning, control robotics, and the applications of artificial intelligence in everyday life.
2. Research and Development: The department strives to be a leading center for research and development in the fields of artificial intelligence and robotics. This includes developing new technologies, improving AI performance, and applying intelligent robotics in various fields such as medicine, industry, and services.
4. Fostering Industrial and Academic Collaboration: The department aims to build strong partnerships with local and international industrial and academic companies and institutions. This is to exchange

knowledge, develop joint projects, and provide training and employment opportunities for students and graduates.

5. **Developing Practical Applications:** The department seeks to develop practical applications that utilize artificial intelligence and robotics technologies to solve modern challenges in various fields. These applications may include intelligent robots for self-service, medical diagnostics, smart transportation, smart agriculture, and more.
6. **Promoting Awareness and Contributing to Society:** The department strives to raise awareness of the importance of technology in society and educate the public about new technologies. It also aims to foster community engagement by organizing awareness events, workshops, and service projects that utilize technology to benefit the community.
7. **Developing National Capabilities:** Developing human and technical capabilities in the fields of artificial intelligence and robotics is a primary objective. The department aims to qualify national talent and cultivate the skills necessary to contribute to technological advancement and the development of the knowledge economy.

1. تقديم برامج تعليمية متميزة: يعد تقديم برامج تعليمية عالية الجودة في مجالات الذكاء الاصطناعي والإنسان الآلي هدفاً رئيسياً. يهدف القسم إلى تدريب وتأهيل الطلاب بمهارات تقنية متقدمة ومعرفة عميقة في مجالات مثل التعلم الآلي، روبوتات التحكم، وتطبيقات الذكاء الصناعي في الحياة اليومية.
2. البحث والتطوير: يسعى القسم إلى أن يكون مركزاً رائداً في البحث والتطوير في مجالات الذكاء الاصطناعي والإنسان الآلي. هذا يشمل تطوير تقنيات جديدة، وتحسين الأداء الذكاء الاصطناعي، وتطبيقات الروبوتات الذكية في مختلف المجالات مثل الطب، والصناعة، والخدمات.
3. تعزيز التعاون الصناعي والأكاديمي: يهدف القسم إلى بناء شراكات قوية مع الشركات والمؤسسات الصناعية والأكاديمية المحلية والعالمية. ذلك لتبادل المعرفة، وتطوير المشاريع المشتركة، وتوفير فرص التدريب والتوظيف للطلاب والخريجين.
4. تطوير تطبيقات عملية: يسعى القسم إلى تطوير تطبيقات عملية تستخدم تقنيات الذكاء الاصطناعي والإنسان الآلي لحل التحديات الحديثة في مختلف المجالات. يمكن أن تشمل هذه التطبيقات الروبوتات الذكية للخدمات الذاتية، والتشخيص الطبي، والنقل الذكي، والزراعة الذكية، وغيرها.
5. تعزيز الوعي والمساهمة في المجتمع: يسعى القسم إلى تعزيز الوعي بأهمية التكنولوجيا في المجتمع وتوعية الجمهور بالتقنيات الجديدة. كما يهدف إلى المشاركة المجتمعية من خلال تنظيم فعاليات توعوية، وورش عمل، ومشاريع خدمية تستخدم التكنولوجيا لخدمة المجتمع.
6. تطوير القدرات الوطنية: يعتبر تطوير القدرات البشرية والتقنية في مجال الذكاء الاصطناعي والإنسان الآلي هدفاً أساسياً. يهدف القسم إلى تأهيل الكوادر الوطنية وتنمية المهارات اللازمة للمساهمة في التقدم التكنولوجي وتطوير الاقتصاد المعرفي.
- 7.

8. Student Learning Outcomes

Outcome 1

Engineering Knowledge

Graduates will be able to apply knowledge of mathematics, computer science, electronics, and engineering principles to analyze and solve complex problems in artificial intelligence and robotics systems.

Outcome 2

Problem Analysis

Graduates will be able to identify, formulate, and analyze complex engineering problems involving intelligent algorithms, autonomous systems, and robotic platforms using appropriate analytical and computational methods.

Outcome 3

System Design

Graduates will be able to design and implement AI-based and robotic systems that meet specified technical, functional, safety, and societal constraints, including ethical and sustainability considerations.

Outcome 4

Experimentation and Data Analysis

Graduates will be able to design and conduct experiments, collect and analyze data, and interpret results related to machine learning models, control systems, sensors, and robotic performance.

Outcome 5

Modern Engineering Tools

Graduates will be able to select and use modern engineering tools, programming environments, simulation platforms, and hardware systems necessary for developing and testing AI and robotic applications.

Outcome 6

Communication Skills

Graduates will be able to communicate effectively, both orally and in writing, technical information, design outcomes, and research findings related to AI and robotics to diverse audiences.

Outcome 7

Ethics and Professional Responsibility

Graduates will be able to recognize ethical, legal, and professional responsibilities in artificial intelligence and robotics engineering, and evaluate the societal impacts of intelligent and autonomous systems.

Outcome 8

Teamwork and Leadership

Graduates will be able to function effectively as a member or leader of multidisciplinary teams to plan, develop, and deliver AI and robotic engineering projects.

Outcome 9

Lifelong Learning

Graduates will be able to acquire and apply new knowledge as needed, using appropriate learning strategies, to adapt to rapid advancements in artificial intelligence, robotics, and related technologies.

9. Academic Staff

Program Manager:

Zaid Al-Shammari | Ph.D in Radio Communication Systems | Lecturer

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10. Credits, Grading and GPA

Credits

Al-karkh University of Science is following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 25 hrs student workload, including structured and unstructured workload.

Grading

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

GRADING SCHEME				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب - قيد المعالجة	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				
Number Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Calculation of the Cumulative Grade Point Average (CGPA)

1. The CGPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

CGPA of a 4-year B.Sc. degree:

$$\text{CGPA} = [(1^{\text{st}} \text{ module score} \times \text{ECTS}) + (2^{\text{nd}} \text{ module score} \times \text{ECTS}) + \dots] / 240$$

11. Curriculum/Modules

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
KUS11001	Mathematics	63	62	5.00	B	
KUS11002	Fundamentals of computer science	48	27	3.00	B	
KUS11003	Democracy and Human Rights	33	17	2.00	B	
CEN11004	Engineering Drawing	48	77	5.00	C	
CEN11005	Physics	63	62	5.00	B	
AIR11006	Engineering Mechanics	63	62	5.00	B	
AIR11007	Discrete logic	63	62	5.00	C	

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Code	Module	SSWL	USSWL	ECTS	Type	Pre-request
AIR12008	Fundamentals of Engineering Mathematics	63	87	6.00	B	
AIR12009	Data Structures and Algorithms	63	87	6.00	B	
KUS12010	Arabic Language	33	17	2.00	B	
KUS12011	English Language	33	17	2.00	B	
AIR12012	Chemistry	63	37	4.00	B	
AIR12013	Workshop	48	27	3.00	S	
AIR12014	Electrical Circuits	78	97	7.00	C	

12. **Contact**

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Al-karkh University of Science

جامعة الكرخ للعلوم

*First Cycle –Four Levels- 240 ECTS - Bachelor's degree (B.Sc.) –
Artificial Intelligence & Robotics Engineering*

الدورة الاولى – اربع سنوات- بكالوريوس هندسة - هندسة الذكاء الاصطناعي والانسان الالي
– 240 وحدة اوروبية



Table of Contents

1. Overview
2. Undergraduate Modules 2025-2026
3. Contact

1. Overview

This catalogue is about the courses (modules) given by the Artificial Intelligence and Robotics Engineering program to gain the Bachelor of Science degree. The program delivers 52 Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج هندسة الذكاء الاصطناعي والانسان الالي للحصول على درجة بكالوريوس العلوم. يقدم البرنامج 52 مادة دراسية، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2025-2026

Module 1

Code	Course/Module Title	ECTS	Semester
KUS11001	Mathematics	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
This course provides students with a comprehensive introduction to integral calculus, focusing on both theoretical understanding and practical application. It establishes a solid foundation in the principles and methods of integration, enabling students to compute indefinite and definite integrals of a wide range of functions. Advanced integration techniques are introduced and explored through illustrative examples that demonstrate their relevance in solving real-world problems. The course emphasizes the development of logical and analytical reasoning skills, fostering a systematic and accurate approach to mathematical problem solving. Applications of integration in geometry, physics, and related fields are examined to reinforce conceptual understanding and practical relevance. By promoting clarity, precision, and structured computation, the course prepares students for advanced studies that require calculus-based analysis and mathematical modeling.			

Module 2

Code	Course/Module Title	ECTS	Semester
KUS11002	Fundamentals of computer science	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	2	48	27
Description			
This course introduces students to the fundamental concepts of computer science, providing a comprehensive overview of computer systems and their practical use. It covers the basic components of computers, including hardware, software, and data representation, along with an introduction to operating systems and graphical user interfaces. The course develops essential digital literacy skills through hands-on experience with word processing, spreadsheet, and presentation software. Students are also introduced to the fundamentals of the Internet, web browsing, and electronic communication, as well as modern concepts of cloud computing and digital collaboration tools. In addition, the course provides an introductory foundation in programming using the Python language, enabling students to develop basic problem-solving skills and computational thinking required for further studies in computing and engineering.			

Module 3

Code	Course/Module Title	ECTS	Semester
KUS11003	Democracy and Human Rights	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			
This course introduces students to the concept of human rights and their fundamental nature, with an emphasis on understanding their philosophical, legal, and social foundations. It examines the historical development of human rights across different eras and civilizations, highlighting the distinction between human rights and other forms of rights. The course explores human rights as reflected in divine religions and analyzes their influence on societies and social values. It also examines the recognition of human rights within international conventions, treaties, and agreements, as well as the role of national legislation in their protection and enforcement. In addition, the course addresses the emergence and role of non-governmental organizations in promoting and defending human rights. The course further introduces the concepts of democracy, freedoms and their various forms, and citizenship as reflected in different legal and legislative systems, aiming to promote civic awareness and responsible participation in society.			

Module 4

Code	Course/Module Title	ECTS	Semester
CEN11004	Engineering Drawing	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	2	48	77
Description			
The module aims to develop students' ability to communicate technical ideas through graphical representation. It covers the fundamentals of engineering drawing, use of instruments, geometric constructions, orthographic and isometric projections, sectional views, and dimensioning. Students will learn to interpret and create machine and assembly drawings following BIS/ISO standards and gain introductory skills in computer-aided drafting (CAD). The course enhances visualization, accuracy, and understanding of engineering components and systems.			

Module 5

Code	Course/Module Title	ECTS	Semester
CEN11005	Physics	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			
This course provides an introduction to the fundamental concepts and core branches of physics, emphasizing physical quantities, units, vectors, and the nature of electric charge, fields, and forces. It examines the structure of atoms, types of matter, and the behavior of electric charge, with particular focus on Coulomb's law, electric dipoles, and electric potential energy. The course develops a solid understanding of basic electrical principles, including Ohm's law, resistance, capacitance, inductance, and the behavior of alternating current (AC) circuits. In addition, it introduces the physics of semiconductors, covering atomic configuration, charge carriers, doping processes, and the distinction between intrinsic and extrinsic materials. The formation and operation of PN junctions and semiconductor diodes under forward and reverse bias conditions are also discussed, providing students with essential knowledge for further studies in electronics and engineering applications.			

Module 6

Code	Course/Module Title	ECTS	Semester
AIR11006	Engineering Mechanics	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	62
Description			

This course introduces the fundamental laws and principles governing static and dynamic systems in engineering. It develops students' ability to analyze and resolve force systems in two and three dimensions using vector methods and Newton's laws of motion. Emphasis is placed on the construction and application of free-body diagrams for the analysis of equilibrium problems and the understanding of frictional forces and their practical engineering applications. The course also introduces the principles of work and energy, including the concept of virtual work, as a foundation for solving mechanical systems. In addition, the study of particle kinematics and kinetics provides a basis for understanding dynamics. Through systematic problem-solving and analytical reasoning, the course prepares students to apply theoretical mechanics concepts to real-world engineering situations.

Module 7

Code	Course/Module Title	ECTS	Semester
AIR11007	Discrete logic	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	63
Description			
This course introduces students to the fundamental principles and applications of digital electronics as a foundation for computing, artificial intelligence, and robotic systems. It provides a solid understanding of number systems, logic circuits, and digital components commonly used in control, embedded, and intelligent applications. Students develop the ability to analyze, design, and implement digital systems that interface with sensors, actuators, and microcontrollers. The course emphasizes the effective use of Boolean algebra, Karnaugh maps, and logic simplification techniques in digital system design. Through the study of combinational and sequential logic circuits, students gain practical skills in designing, testing, and evaluating digital systems. In addition, the course enhances logical reasoning, abstraction, and problem-solving abilities, while encouraging the integration of digital logic concepts into broader areas of automation, computing, and artificial intelligence.			

Module 8

Code	Course/Module Title	ECTS	Semester
AIR12008	Fundamentals of Engineering Mathematics	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
Description			
This module introduces the mathematical concepts essential for engineering studies. Students develop skills in algebra, trigonometry, calculus, matrices, and differential equations. The course emphasizes analytical thinking and mathematical modelling to solve engineering problems. Practical applications are incorporated to demonstrate the relevance of mathematics in engineering disciplines. Upon completion, students will possess the quantitative foundation required for advanced engineering courses.			

Module 9

Code	Course/Module Title	ECTS	Semester
AIR12009	Data Structures and Algorithms	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	87
Description			
This module provides an introduction to the fundamental principles of data organisation and algorithm design. Students learn about arrays, linked lists, stacks, queues, trees, graphs, and sorting and searching techniques. The course focuses on algorithm efficiency, problem-solving strategies, and computational complexity. Practical programming exercises reinforce theoretical concepts and improve coding skills. By the end of the module, students will be able to design efficient solutions to computational problems.			

Module 10

Code	Course/Module Title	ECTS	Semester
KUS12010	Arabic Language	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			
يركز المقرر اللغة العربية على تطوير المهارات اللغوية، والكتابة الصحيحة، والتواصل المهني. يغطي المقرر القواعد النحوية الأساسية مثل بنية الجملة، وعلامات الإعراب، والأخطاء الشائعة. ويتناول أصول الإملاء الوظيفي مثل قواعد كتابة الهمزات وعلامات الترقيم. كما يشمل المنهج مهارات الكتابة الفنية لإعداد التقارير الهندسية والرسائل الرسمية والسير الذاتية. أخيرًا، يتضمن المقرر تحليل نصوص أدبية لتنمية التذوق البلاغي وزيادة الحصيلة اللغوية للتحدث والإلقاء بوضوح.			

Module 11

Code	Course/Module Title	ECTS	Semester
KUS12011	English Language	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	-	33	17
Description			

This module develops students' English language proficiency with an emphasis on engineering and scientific communication. It strengthens reading, writing, listening, and speaking skills required for academic success. Students practice technical vocabulary, report writing, presentations, and professional correspondence. The course also enhances comprehension of engineering literature and international standards. By the end of the module, students will be able to communicate effectively in global academic and professional settings.

Module 12

Code	Course/Module Title	ECTS	Semester
AIR12012	Chemistry	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	63	37
Description			
This module introduces the fundamental principles of chemistry relevant to engineering applications. Students study atomic structure, chemical bonding, reactions, thermodynamics, materials, and corrosion processes. Laboratory activities reinforce theoretical concepts through practical experimentation and scientific observation. The course highlights the role of chemistry in material selection, manufacturing, and environmental sustainability. Successful completion provides a solid scientific foundation for engineering studies.			

Module 13

Code	Course/Module Title	ECTS	Semester
AIR12013	Workshops	3	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
-	3	48	27
Description			
This module provides hands-on training in engineering workshop practices and safe working procedures. Students gain practical experience with common hand tools, measuring instruments, machining operations, fabrication techniques, and basic manufacturing processes. Emphasis is placed on workplace safety, precision, quality control, and teamwork. Practical exercises help students develop technical competence and problem-solving abilities. By the end of the module, students will have the practical skills necessary for laboratory and engineering workshop environments.			

Module 14

Code	Course/Module Title	ECTS	Semester
AIR12014	Electrical Circuits	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	97
Description			
This module introduces the fundamental concepts of electrical circuit analysis and design. Students study voltage, current, resistance, power, Ohm's Law, Kirchhoff's Laws, and basic AC and DC circuit behaviour. Practical laboratory sessions develop skills in circuit construction, measurement, and troubleshooting using standard electrical instruments. The course establishes the theoretical and practical foundation required for advanced electrical and electronic engineering subjects. Upon completion, students will be able to analyse and interpret basic electrical circuits confidently.			

Contact

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	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Engineering Mechanics			Module Delivery	
Module Type	Basic learning activities			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	AIR11006				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level			Semester of Delivery		
Administering Department		AI & Robotics	College	Engineering	
Module Leader	Dr. Aws Khalid Ibrahim		e-mail	aws.khalid@kus.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D
Module Tutor	Dr. Aws Khalid Ibrahim		e-mail	aws.khalid@kus.edu.iq	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number	1.0	
Relation with other Modules					
العلاقة مع المواد الدراسية الأخرى					
Prerequisite module				Semester	
Co-requisites module				Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To introduce the fundamental laws and principles governing static and dynamic systems in engineering. 2. To develop the ability to analyze and resolve force systems in two and three dimensions. 3. To enable students to apply Newton's laws and vector methods to solve mechanical problems. 4. To teach the construction and use of free-body diagrams for equilibrium analysis. 5. To provide understanding of frictional forces and their engineering applications. 6. To introduce the principles of work and energy through the concept of virtual work. 7. To lay the foundation for dynamics through the study of particle kinematics and kinetics. 8. To enhance students' analytical reasoning, problem-solving, and application of theoretical mechanics to real-world engineering contexts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define the basic concepts of mechanics, including force, mass, and motion, and distinguish between scalars and vectors. 2. Apply Newton's laws of motion to model and solve static and dynamic problems. 3. Analyze two-dimensional and three-dimensional force systems and determine their resultants. 4. Draw and interpret free-body diagrams for particles and rigid bodies in equilibrium. 5. Apply equilibrium equations to two- and three-dimensional structures and mechanical systems. 6. Explain and compute the effects of friction in engineering applications. 7. Understand and apply the principle of virtual work for equilibrium analysis. 8. Describe particle motion in terms of displacement, velocity, and acceleration, and apply kinetic equations of motion. 9. Demonstrate the ability to solve engineering problems systematically using vector and analytical approaches.
Indicative Contents المحتويات الإرشادية	Introduction to Statics Covers fundamental mechanics concepts, including force, mass, weight, particle systems, and rigid bodies. Introduces scalar and vector quantities, vector addition,

	and Newton's laws of motion. Students also learn about the law of gravitation and standard units used in mechanics. [6 hrs] Two-Dimensional Force Systems Students analyze planar force systems through vector components, moments, and couples. Emphasis is placed on the use of the parallelogram law, rectangular components, and calculation of resultants. Practical examples illustrate the use of equilibrium and resultant forces in 2D systems. [8 hrs] Three-Dimensional Force Systems Extends force analysis into three-dimensional space. Students learn to resolve and combine forces, compute moments and couples, and determine resultants using vector algebra. Applications include real-world structures and mechanical assemblies in 3D. [8 hrs] Equilibrium in Two and Three Dimensions Focuses on equilibrium conditions for particles and rigid bodies. Students learn to isolate systems using free-body diagrams and apply equilibrium equations ($\Sigma F = 0$, $\Sigma M = 0$) in both 2D and 3D contexts. Engineering examples include frames, machines, and trusses. [10 hrs] Friction Phenomena Introduces the concept of friction, its physical basis, and types (static, kinetic, rolling). Students study dry friction and its applications in mechanical design such as wedges, belts, and screw systems. [6 hrs] Principle of Virtual Work Students explore the principle of work and energy, including the work done by a force or couple and the conditions for equilibrium based on virtual work. This provides a conceptual bridge between statics and dynamics. [6 hrs] Introduction to Dynamics Introduces kinematics of particles — displacement, velocity, and acceleration — and their vector representation. Covers rectilinear motion and the relationship between motion and applied forces. [6 hrs] Kinetics of Particles Students apply Newton's second law to particle motion, relating force, mass, and acceleration. Real-life problems are solved involving linear motion, variable forces, and momentum. [6 hrs] Review and Final Exam Preparation A comprehensive review of all topics. Students consolidate knowledge of statics and dynamics through problem-solving and discussion of integrated engineering examples. [6 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Lectures: Interactive lectures will provide theoretical knowledge on engineering mechanics concepts, techniques, and applications. 2. Tutorial Sessions: Hands-on laboratory sessions will allow students to practice and develop skills in engineering mechanics (statics and dynamics). 3. Case Studies: Analysis of real-world examples and case studies will help students understand the practical applications of engineering mechanics. 4. Independent Research Projects: Students will be encouraged to undertake independent research projects using engineering techniques to gain practical experience and develop research skills. 5. Group Discussions: Group discussions and peer-to-peer learning will foster collaboration and deeper understanding of statics and dynamics concepts. 6. Assessments: including quizzes, laboratory reports, and a final examination, will evaluate students' understanding of theoretical knowledge and their ability to apply engineering mechanics methods.
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5,10	LO #1- #6 and #7-#10
	Assignments	1	10% (10)	11	LO #6 and #10
	Projects / Lab.	1	10% (10)	12	All
	Report	1	10% (10)	7	All
Summative assessment	Midterm Exam	2hr	10% (10)		LO #1 - #7
	Final Exam	3hr	50% (50)		All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to statics • Mechanics, Basic Concepts, Scalars and Vectors. • Newton's Laws, Units, and Law of Gravitation.
Week 2	Two-dimensional force systems • Rectangular Components of 2D forces
Week 3	Two-dimensional force systems • Moment and Couple
Week 4	Two-dimensional force systems • Resultants of 2D forces
Week 5	Three-dimensional force systems • Rectangular Components of 3D forces
Week 6	Three-dimensional force systems • Moment and Couple
Week 7	Three-dimensional force systems • Resultants of 3D forces
Week 8	Class Discussions and Mid-term exam
Week 9	Equilibrium in Two Dimensions • System Isolation and the Free-Body Diagram of 2D systems • Equilibrium Conditions •

Week 10	Equilibrium in Three Dimensions • Free-Body Diagram of 3D systems • Equilibrium Conditions
Week 11	Friction Phenomena • Types of friction. • Dry friction.
Week 12	Virtual Work • Work of a force and a couple. • Equilibrium conditions in terms of virtual work.
Week 13	Introduction to Dynamics • Kinematics of particles. • Rectilinear motion (velocity and acceleration).
Week 14	Kinetics of Particles • Equation of motion • Rectilinear motion (force and mass)
Week 15	Review and Final Exam Preparation • Comprehensive course review and revision.

Delivery Plan (Weekly Tutorial Syllabus) المنهاج الاسبوعي لدرس التمرين	
	Material Covered
Week 1	Introduction to statics • Description of Mechanics, Basic Concepts, Scalars and Vectors. • practice of Newton's Laws, Units, and Law of Gravitation.
Week 2	Two-dimensional force systems • Problems in Rectangular Components of 2D forces
Week 3	Two-dimensional force systems • Tutorial in Moment and Couple
Week 4	Two-dimensional force systems • Problems in Resultants of 2D forces
Week 5	Three-dimensional force systems

	• Tutorial in Rectangular Components of 3D forces
Week 6	Three-dimensional force systems • Problems in Moment and Couple
Week 7	Three-dimensional force systems • Tutorial in Resultants of 3D forces
Week 8	Class Discussions and Mid-term exam
Week 9	Equilibrium in Two Dimensions • Practice of the Free-Body Diagram of 2D systems • Solving problems about Equilibrium Conditions
Week 10	Equilibrium in Three Dimensions • Practice of the Free-Body Diagram of 3D systems • Solving problems about Equilibrium Conditions
Week 11	Friction Phenomena • problems in case studies of friction .
Week 12	Virtual Work • Practice Work of a force and a couple. • Solving problems in Equilibrium conditions for virtual work.
Week 13	Introduction to Dynamics • Description of Kinematics of particles. • Tutorial in Rectilinear motion (velocity and acceleration).
Week 14	Kinetics of Particles • Interpretation of Equation of motion • Tutorial in Rectilinear motion (force and mass)
Week 15	Review and Final Exam Preparation • Comprehensive course review and revision.

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. James L. Meriam , L. G. Kraige , J. N. Bolton, 2016 . Engineering Mechanics: Statics, 8 th ed. John Wiley & Sons Singapore Pte. Ltd. 2. James L. Meriam , L. G. Kraige , J. N. Bolton, 2015 . Engineering Mechanics: Dynamics, 8 th ed. John Wiley & Sons.	yes
Recommended Texts	1. Russell Hibbeler, 2015. Engineering Mechanics: Statics & Dynamics 14 th ed.	
Websites	https://www.engineer4free.com/statics.html https://www.engineer4free.com/dynamics.html	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Discrete logic			Module Delivery	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	AIR11007				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		Semester of Delivery			
Administering Department	AI & Robotics		College	Engineering	
Module Leader	Dr. Zaid Al-Shammari		e-mail	Zaid.shaker.elc@kus.edu.iq	
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	Ph.D	
Module Tutor	Lec. Ahmed Sabri		e-mail	eng.ahmed.sabri@kus.edu.iq	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date	30/6/2026		Version Number	1	
Relation with other Modules					
العلاقة مع المواد الدراسية الأخرى					
Prerequisite module	None			Semester	
Co-requisites module	None			Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	This module aims to : 1. To introduce students to the fundamental principles of digital systems and their applications. 2. To distinguish between analog and digital signals and understand the advantages of digital systems. 3. To develop proficiency in number systems, binary arithmetic, and data representation. 4. To teach the design and simplification of logic circuits using Boolean algebra and Karnaugh maps. 5. To explain combinational logic circuits and their real-world applications. 6. To introduce sequential logic circuits, including flip-flops, counters, and registers. 7. To enhance problem-solving and design skills for digital systems in AI, robotics, and automation. 8. To prepare students for advanced courses in digital electronics, computer architecture, and embedded systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the difference between analog and digital signals and describe the role of digital systems in modern engineering. 2. Convert numbers between binary, octal, decimal, and hexadecimal systems, and perform binary arithmetic operations. 3. Construct and interpret truth tables for basic and complex logic gates. 4. Apply Boolean algebra laws and theorems to simplify logic expressions and circuits. 5. Use Karnaugh maps to minimize logic functions and design optimized circuits. 6. Design basic combinational logic circuits, including adders, subtractors, multiplexers, demultiplexers, encoders, and decoders. 7. Explain the principles of sequential circuits, including latches, flip-flops, and memory elements. 8. Design counters, registers, and sequential systems using flip-flops and timing diagrams. 9. Apply digital logic concepts to real-world problems in robotics, AI, and automated control systems. 10. Demonstrate systematic problem-solving and circuit design skills in digital logic projects.
Indicative Contents المحتويات الإرشادية	Introduction to Digital and Analog Systems This section covers the basic distinction between analog and digital signals, their advantages and limitations, and practical applications in AI and robotics. Students explore how digital systems form the backbone of modern computational and control technologies. [5 hrs]

	Number Systems and Binary Arithmetic Students study binary, octal, decimal, and hexadecimal systems, including number conversions and binary arithmetic operations. Exercises emphasize accuracy in representation and computation, preparing students for circuit design and digital data manipulation. [8 hrs] Logic Gates and Truth Tables This section introduces the basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), their symbols, truth tables, and practical applications. Students learn to represent logical functions using gates and analyze simple logic circuits. [8 hrs] Boolean Algebra and Karnaugh Map Simplification Students learn Boolean algebra laws and theorems to simplify expressions. Karnaugh maps are used to minimize logic functions efficiently, enabling optimized circuit design for real-world engineering problems. [10 hrs] Combinational Logic Circuits Topics include the design of half and full adders, subtractors, multiplexers, demultiplexers, encoders, and decoders. Students practice constructing combinational circuits for practical applications in AI, robotics, and automated systems. [12 hrs] Sequential Logic Circuits Introduction to sequential logic, including memory concepts, latches, flip-flops (SR, JK, D, T), edge-triggering, and clock behavior. Students learn to design counters, registers, and sequence-generating circuits using flip-flops and timing diagrams. [15 hrs] Applications of Combinational and Sequential Logic This section focuses on implementing control logic and decision-making circuits in robotics and automation. Case studies demonstrate how digital logic solves real-world engineering problems, bridging theory and practice. [12 hrs] Revision and Problem-Solving Comprehensive exercises cover all topics, reinforcing problem-solving, circuit design, and analytical reasoning. Students consolidate their knowledge and prepare for exams and project applications. [17 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Interactive Lectures: Provide theoretical knowledge on core concepts such as number systems, Boolean algebra, and the operation of combinational and sequential logic circuits. 2. Hands-on Laboratory Sessions: Allow students to build and test logic circuits using hardware (like breadboards and ICs) or simulation software (e.g., Logisim). This develops practical skills in circuit implementation, analysis, and troubleshooting. 3. Problem-Solving Exercises: Focus on applying Boolean algebra and Karnaugh maps to simplify logic expressions and design optimized circuits. 4. Case Studies and Applications: Analyze real-world examples of how digital logic is used in robotics, AI, and automated control systems, bridging theory and practice. 5. Group Discussions and Collaborative Projects: Encourage teamwork in designing and implementing digital logic projects, fostering a deeper understanding and shared problem-solving skills. 6. Assessments: Use quizzes, assignments, lab reports, a mid-term exam, and a final exam to evaluate students' understanding of theoretical concepts and their ability to apply design techniques.
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1- #5 and #6-#10
	Assignments	2	10% (10)	Continuous	LO #5 and #10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Digital and Analog Systems • Difference between analog and digital signals. • Role of digital systems in AI and robotics.
Week 2	Number Systems and Binary Arithmetic • Binary, octal, decimal, and hexadecimal systems. • Number conversions and binary operations.
Week 3	Logic Gates and Truth Tables • Basic logic operations (AND, OR, NOT, NAND, NOR, XOR, XNOR). • Circuit representation and practical examples.
Week 4	Boolean Algebra • Laws and theorems of Boolean algebra. • Simplifying digital circuits using Boolean expressions.
Week 5	Karnaugh Map (K-Map) Simplification • Logic function minimization using K-Maps. • Designing optimized logic circuits.
Week 6	Combinational Logic Circuits – Part 1 • Half and full adders, subtractors. • Basic combinational circuit design.
Week 7	Mid-term Exam
Week 8	Combinational Logic Circuits – Part 2 • Multiplexers, demultiplexers, encoders, and decoders.

	Practical Applications of Combinational Logic • Designing control and decision circuits. • Real-world examples in robotics and AI.
Week 9	Introduction to Sequential Logic Circuits • Basic concepts of memory and timing. • Introduction to latches and flip-flops. •
Week 11	Flip-Flop Types and Applications • SR, JK, D, and T flip-flops. • Edge-triggering and clock behavior. •
Week 12	Sequential Circuits Design • Using flip-flops to design counters and registers. • Timing diagrams and sequence generation. •
Week 13	Counters and Shift Registers • Asynchronous and synchronous counters. • Shift register operation and applications. •
Week 14	Sequential Circuits – Applications • Implementing control logic using sequential circuits. • Case studies in robotics and automation. •
Week 15	Review and Final Exam Preparation • Comprehensive course review and practical revision. •

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to the Digital Laboratory Familiarization with lab equipment (breadboard, power supply, logic probes); safety instructions and introduction to digital signals.
Week 2	Number Systems and Logic Levels Practice binary-to-decimal conversion and verify digital HIGH/LOW levels using simple LED circuits.
Week 3	Logic Gates – Basic Operations Build and test basic logic gates (AND, OR, NOT, NAND, NOR) using ICs; verify truth tables.
Week 4	Logic Gates – Combined Circuits Construct compound logic expressions; analyze and test outputs using logic probes or simulation.
Week 5	Boolean Algebra and Simplification Apply Boolean simplification on given circuits and implement simplified versions using hardware or simulation software (e.g., Logisim).
Week 6	Karnaugh Map Practice Simplify logic functions using K-map methods and compare complexity before and after reduction.
Week 7	Midterm Lab Evaluation Assessment on experiments from Weeks 1–6 (circuit building, analysis, and documentation).
Week 8	Combinational Logic Circuits – Adders/Subtractors Design and implement half adder and full adder/subtractor circuits; verify functionality.
Week 9	Combinational Circuits – MUX and DEMUX Build multiplexer and demultiplexer circuits and explore their data-routing applications.
Week 10	Encoders and Decoders Construct simple encoder and decoder circuits and test their operation using binary inputs.
Week 11	Introduction to Sequential Logic Observe latch and flip-flop behavior using LEDs; understand SR, D, and JK flip-flops.
Week 12	Flip-Flop Timing and Triggering Explore clock signals and triggering (edge vs. level); measure response using oscilloscopes or simulation.

Week 13	Counters Design and test asynchronous and synchronous counters using flip-flops or IC counters.
Week 14	Shift Registers Implement and test serial-in/serial-out and parallel-in/parallel-out shift registers.
Week 15	Final Lab Assessment and Demonstration

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Floyd, T.L., 2011. Digital fundamentals, 10/e. Pearson Education India.	yes
Recommended Texts	1. Shiva, S.G. ed., 2018. Introduction to logic design. CRC Press. FLOYD, Thomas L., and David BUCHLA. 2. Nixon, M.S., 2015. Digital Electronics: A Primer-Introductory Logic Circuit Design (Vol. 1). World Scientific Publishing Company.	yes
Websites	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Electrical Circuits		Module Delivery
Module Type	C		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	AIR12014		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	1	Semester of Delivery	
Administering Department	AI and Robotics	College	2
Module Leader	Zaid Al-Shammari	e-mail	College of Engineering
Module Leader’s Acad. Title	lecturer	Module Leader’s Qualification	zaid.shaker.elc@kus.edu.iq
Module Tutor	Osama Mohammed Noori	e-mail	Ph.D
Peer Reviewer Name	/	e-mail	osama20111989@kus.edu.iq
Scientific Committee Approval Date	30/6/2026	Version Number	/
			1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Introduce the fundamental concepts of electrical circuits, including current, voltage, basic circuit elements, and the passive sign convention. 2. Develop the ability to analyze DC circuits using Ohm's Law and Kirchhoff's Laws, and to simplify circuits through network reduction and series-parallel resistor combinations. 3. Understand time-varying signals in AC circuits and calculate important parameters such as average and RMS values. 4. Explain the behavior of energy storage elements, including capacitors and inductors, and analyze steady-state sinusoidal AC circuits. 5. Analyze RL, RC, and RLC circuits in both time and frequency domains, including resonance, Q-factor, and frequency response using Bode plots. 6. Apply circuit analysis techniques such as Thevenin's Theorem, current and voltage division, and Maximum Power Transfer Theorem, while understanding power dissipation and basic protection methods in electrical circuits.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the basic concepts of electrical circuits including current, voltage, and circuit components. 2. Analyze DC circuits using Ohm's Law and Kirchhoff's Laws. 3. Evaluate AC signals by calculating average and RMS values and understanding sinusoidal steady-state behavior. 4. Describe the operation of capacitors and inductors as energy storage elements in AC circuits. 5. Analyze RL, RC, and RLC circuits in time and frequency domains including resonance and frequency response. 6. Apply circuit theorems such as Thevenin's Theorem and Maximum Power Transfer Theorem to evaluate circuit performance and power dissipation.

Indicative Contents المحتويات الإرشادية	1. DC Circuits: Fundamental definitions of current and voltage, the passive sign convention, and basic circuit components. Methods for combining resistors in series and parallel configurations. Application of Kirchhoff's Laws and Ohm's Law in circuit analysis. Structure of electrical circuits and techniques for network reduction. [15 hours] 2. AC Circuits I: Analysis of time-varying signals, including calculation of average and RMS values. Introduction to capacitors and inductors as energy-storing components, and basic steady-state sinusoidal analysis in AC circuits. [20 hours] 3. AC Circuits II: Study of RL, RC, and RLC circuits, including the frequency response of RLC networks. Basic filter circuits such as band-pass filters, resonance behavior, and the quality factor (Q-factor). Use of Bode plots for frequency analysis, along with differential equations to determine circuit behavior. Examination of time responses, including natural and step responses, and an introduction to second-order circuits. [20 hours] 4. Analysis of resistive networks using voltage and current sources, including application of Thevenin's Theorem, current and voltage division, and evaluation of input and output resistance. The topic also introduces the Maximum Power Transfer Theorem, RMS values, power dissipation, and basic protection methods such as current limiting and over-voltage protection. [20 hours]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Present key concepts through structured explanations and visual aids. 2. Discussions: Encourage interaction and exchange of ideas to clarify concepts. 3. Practical activities: Apply theory through laboratory work, simulations, and exercises. 4. Questions and feedback: Provide opportunities for questions and immediate clarification.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	97	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Resistance, conductance, effect of temp. on the resistance value
Week 2	Ohm's law, series connection, parallel connection, compound connection
Week 3	Voltage and current divider solved examples, Kirchhoff's laws
Week 4	Star-delta conversion examples
Week 5	Thevenin's theorem, maximum power transfer
Week 6	Nodal method, superposition
Week 7	Alternating voltage and current
Week 8	Frequency, period, instantaneous value of voltage and current

Week 9	Component of A.C circuit, pure resistance, pure inductance, pure capacitance
Week 10	Series A.C circuit, R,L,C in series
Week 11	Impedance, phase angle, resonance, phase diagram
Week 12	Parallel A.C circuit, R,L,C, Admittance, power factor
Week 13	Active, reactive, apparent power in A.C circuit
Week 14	3-phase circuit
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: DC Voltage and current Measurement
Week 2	Lab 2: Ohm's law.
Week 3	Lab 3: Power in DC Circuit
Week 4	Lab 4: Voltage and current divider rules
Week 5&6&7	Lab 5: Kirchhoff's laws
Week 8&9	Lab 6: Thevenin's Theorem
Week 10&11	Lab 7: Series RLC circuit
Week 12&13&14	Lab 8: Parallel RLC circuit
Week 15	Testing and Evaluation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Robert L. Boylestad, <i>Introductory Circuit Analysis</i>, 10th/11th/12th ed., Pearson Education, 2010–2019.	Yes
Recommended Texts	- Charles K. Alexander and Matthew N. O. Sadiku, <i>Fundamentals of Electric Circuits</i>, 5th or later ed., McGraw-Hill Education, 2013–2020. - William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin, <i>Engineering Circuit Analysis</i>, 8th or later ed., McGraw-Hill Education, 2012–2019.	No

Websites	https://www.allaboutcircuits.com/textbook/direct-current/chpt-1/conductors-insulators-electron-flow/
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Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Engineering Drawing		Module Delivery		
Module Type	Core		✓ Theory ✓ Lecture Lab Tutorial ✓ Practical Seminar		
Module Code	CEN11004				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		First	Semester of Delivery		1
Administering Department			College	Engineering	
Module Leader	Dr. Maad Abdullah Hussein		e-mail	maad@kus.edu.iq	
Module Leader’s Acad. Title		Ass. Prof.	Module Leader’s Qualification		
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	This course discusses the fundamental concepts of engineering graphics. It gives also an introduction to computer graphics using CAD software. The following topics are aimed to covered: 1- Drawing conventions such as standards, line types and dimensioning. 2- Drawing of inclined and curved surfaces. 3- Deducting the orthographic views from a pictorial. 4- Drawing full and half sections; deducting an orthographic view from given two views. 5- Pictorial sketching (isometric and oblique).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize the value of engineering graphics as a language of communication. 2. Infer the nature of engineering graphics, the relationships between 2D and 3D environments. 3. Comprehend and deduce orthographic projections of an object. 4. Visualize wide variety of objects and drawing the missing views. 5. Comprehend and deduce section views. 6. Produce three dimensional drawings utilizing CAD software. 7. Navigate the AutoCAD user interface, including menus, toolbars, and the drawing workspace. 8. Apply appropriate coordinate systems for accurate point placement in drawings. 9. Apply keyboard shortcuts and command syntax to speed up drawing operations. 10. Demonstrate printing and plotting with real examples using different configurations.

Indicative Contents المحتويات الإرشادية	• Introduction to Engineering Drawing: Purpose, importance, and applications of engineering drawing in engineering communication. [3 hrs] • Drawing Instruments and Standards: Introduction to drawing tools, line types, lettering, scales, and dimensioning standards. [4 hrs] • Geometric Constructions: Basic geometric constructions, tangents, arcs, polygons, and ellipse drawing methods. [6 hrs] • Orthographic Projection: Principles of projection, projection planes, first and third angle projections, and drawing multiple views. [6 hrs] • Inclined and Curved Surfaces: Projection and representation of inclined planes, curved surfaces, and complex shapes. [5 hrs] • Sections and Sectional Views: Purpose of sections, full and half sections, cutting planes, and representation of materials. [5 hrs] • Pictorial Drawing: Isometric, oblique, and perspective sketches; visualization of 3D objects from 2D drawings. [4 hrs] • Dimensioning and Annotations: Dimension types, placement rules, tolerance indication, and technical lettering. [3 hrs] • Introduction to CAD Software (AutoCAD): Basic interface, coordinate systems, drawing and modification commands. [4 hrs] • CAD Drawing Applications: Creating 2D engineering drawings, layering, scaling, and dimensioning using AutoCAD. [4 hrs] • Printing and Plotting Techniques: Setting up layouts, plotting views, and exporting drawings with correct scale and format. [3 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Explain key principles of engineering drawing supported by visual examples and demonstrations. 2. Laboratory Work: Apply concepts through manual sketching and CAD-based practical exercises. 3. Demonstrations: Use live drawing sessions to illustrate projection, sectioning, and geometric construction methods.

	4. Assignments: Reinforce understanding through individual and group drawing tasks. 5. Feedback and Review: Provide continuous feedback during labs and assignments to enhance technical accuracy and skills.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10 % (8)	5, 10	LO #3, 4, 5 and 6
	Assignments	1	10 % (2)	14	LO # 3, 4, 5,6 and 7
	Projects / Lab.	15	10% (15)	Continuous	All
	Projects / Home.	15	10% (15)	Continuous	All
Summative assessment	Midterm Exam	2hr	20 % (20)	7	LO # 1-5
	Final Exam	3hr	40% (40)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction and Instruments
Week 2	Kufic letters
Week 3	Principles of putting dimensions: Basic dimensions, the true dimensions, extension lines, lines of dimension
Week 4 to Week 6	Geometric construction: Draw an arc touches two intersecting lines, draw arc touches two brackets, draw an arc touches a straight and passes a point, draw an ellipse, draw a hexagon, draw the quinary, draw shape with eight faces, sketching inverted arc, identify points of contact

Week 7 to 9	Projections: The theory of projection, the projection lines, oblique projection level, the vertical projection system, multiple projections, conclusion the third projected, draw curves and oblique surfaces on the projections
Week 10 to 11	Isometric: Projection by the first even angles, projection by the third even angles, draw circles on dimensional figure, draw oblique surfaces on dimensional figure, Isometric drawing and its application
Week 12 to 13	Sections: Introduction, types of sections and symmetrical sections, cutting lines, double sections, elevations sectioned, shapes sectioned
Week 14 to 15	CAD Drawing: Introduction to AutoCAD software, control page in AutoCAD software, types of coordinate, the command line and applications, the modified commands, the help orders in drawing, the commands circle, rectangle, offset, the command layers array, scale and aligned, the command arc with all options, the command polyline with options , types of dimensions with application examples, the command text and its types, preparing and printing options with examples.

Learning and Teaching Resources				
مصادر التعلم والتدريس				
	Text			Available in the Library?
Required Texts	الرسم الهندسي للمؤلف عبد الرسول الخفاف			1- نعم
Recommended Texts	Interpreting Engineering Drawings, Jensen, C.H. and Helsel, G.D., 7th ed., Thomson Delmar Learning, 2007			2- نعم
Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Physics			Module Delivery	
Module Type	Basic			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	CEN11005				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		1	Semester of Delivery		1
Administering Department		AI & Robotics	College	College of Eng.	
Module Leader	Dr. Ghaiath A. Fadhil		e-mail	Ghaiath.Fadhil@kus.edu.iq	
Module Leader’s Acad. Title		Lecturer	Module Leader’s Qualification		
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	- To introduce the fundamental concepts and branches of physics, including physical quantities, units, vectors, and the nature of electric charge, fields, and forces. - To explain the structure of atoms, types of matter, and the behavior of electric charge, emphasizing Coulomb's law, electric dipoles, and electric potential energy. - To develop understanding of basic electrical principles, including Ohm's law, resistance, capacitance, inductance, and the behavior of AC circuits - To introduce the physics of semiconductors, including atomic configuration, carrier concentration, doping, and the distinction between intrinsic and extrinsic materials. - To describe the formation and operation of PN junctions and semiconductor diodes under forward and reverse bias.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Explain the fundamental concepts and branches of physics, including physical quantities, units, vectors, and the nature of electric charge, fields, and atomic structure. Apply the principles of electric charge interactions, including charging by induction and friction, Coulomb's law, and electric field analysis using field lines and dipole concepts. Analyze basic DC and AC circuits by applying Ohm's law and the concepts of resistance, capacitance, and inductance, including series and parallel connections. Calculate inductive and capacitive reactances (X_L and X_C) and evaluate circuit behavior under different electrical conditions. Describe the atomic structure, electronic configuration, and carrier behavior in intrinsic and extrinsic semiconductors, including the effects of doping. Explain the formation, biasing, and characteristics of PN junctions and semiconductor diodes, including Zener behavior and VI characteristics. Design and test diode-based and semiconductor circuits such as rectifiers, voltage regulators.

Indicative Contents المحتويات الإرشادية	• Introduction to Physics and Physical Quantities Branches of physics, fundamental quantities, units, and vectors. Measurement systems and dimensional analysis. [4 hrs] • Electric Charge and Structure of Matter Electric charge, structure of atoms, and types of matter. Conservation of charge, charging by induction and friction. [4 hrs] • Electric Forces and Fields Electric forces on uncharged objects, Coulomb's law, and the concept of the electric field. Electric field due to a point charge and representation using field lines. [5 hrs] • Electric Dipoles and Potential Energy Electric dipole concepts, forces and moments on dipoles, and electric potential energy in electrostatic systems. [3 hrs] • Current, Resistance, and Capacitance Ohm's law, electrical resistance, and capacitance. Capacitors in series and parallel connections. Introduction to RC circuits and their behavior. [8 hrs] • Inductance and AC Circuits Principles of inductance, inductive reactance (X_L), capacitive reactance (X_C), and basic AC circuit analysis. [8 hrs] • Physics of Semiconductors Atomic structure, electronic configuration, energy bands in solids, and types of materials (conductors, insulators, semiconductors). [5 hrs] • Carrier Concentration and Doping Intrinsic and extrinsic semiconductors, carrier generation and recombination, N-type and P-type semiconductors, and doping effects. [8 hrs] • PN Junction Theory Formation of depletion region, junction potential, and VI characteristics under forward and reverse bias conditions. [8 hrs] • Semiconductor Diodes Operating principles, actual diode characteristics, Zener region, and temperature effects. [11 hrs] • Diode Applications Load-line analysis, rectifier circuits (half-wave and full-wave). [8 hrs] • Laboratory Applications Practical experiments involving diode and transistor circuits, measurements, analysis, and verification of theoretical concepts. [10 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lectures: Present key concepts from basic physics to semiconductor theory using visuals, simulations, and real-world examples. • Tutorials: Reinforce understanding through problem-solving on electric fields, circuits, and semiconductor behavior. • Laboratory Work: Conduct hands-on experiments on electrical circuits, PN junctions, and diode characteristics. • Active Learning: Encourage participation through discussions, demonstrations, and short in-class activities.

	Independent Study: Support self-learning using textbooks, online resources, and preparatory review before exams.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4
Unstructured SWL (h/sem)	62	Unstructured SWL (h/w)	4
Total SWL (h/sem)	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1-3
	Assignments	2	10% (10)	2, 12	LO # 1-3
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 2-4
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Branches of physics, Fundamental quantities ,Units, and vectors.
Week 2	Electric charge, electric field and structure of atoms, types of matter, charge is conserved, charging by induction and friction.
Week 3	Electric forces on uncharged objects, Coulomb's law.

Week 4	Electric field, electric field on a point charge, electric field lines.
Week 5	Electric dipole, forces, moments and electric potential energy.
Week 6	Ohm's Law, resistance and capacitance.
Week 7	Capacitor in series and parallel, inductive CCT.
Week 8	Inductive resistance X_L , capacitive reactance X_C .
Week 9	Mid exam
Week 10	Semiconductors, some definitions and the electronic configuration in atoms
Week 11	Carrier concentration in intrinsic semiconductor and doping
Week 12	Intrinsic semiconductors and extrinsic semiconductors, N - type Semiconductors , P - type semiconductors
Week 13	PN Junction: Formation of Depletion layer, Junction Potential, Forward Biased PN junction, Reverse biased PN junction.
Week 14	Semiconductor diodes: diode operating conditions, actual diode characteristics, Zener Region
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

	Material Covered
Week 1,2	Ohm's Law and Non Ohmic materials
Week 3,4	Electrical resonance phenomenon
Week 5,6	Generating electricity using field magnetic
Week 7,8	Calculating the electrical forces and Distance between electrical charges
Week 9,10	P.N junction diode
Week 11,12	Experience Diode properties
Week 13,14	Using a silicon transistor as a circuit switch

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Halliday, D., Resnick, R., & Walker, J. (2013). Fundamentals of Physics, 10th Edition, Wiley.	yes
Recommended Texts	Neamen, D. A. (2012). <i>Semiconductor Physics and Devices: Basic Principles</i> , 4th Edition, McGraw-Hill Education.	yes
Websites	- HyperPhysics: https://hyperphysics.phy-astr.gsu.edu - Khan Academy (Physics & Circuits): https://www.khanacademy.org/science/physics - Electronics-Notes: https://www.electronics-notes.com	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Data Structure		Module Delivery
Module Type	B		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	AIR12009		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester of Delivery	2
Administering Department	AI & Robotics	College	College of Engineering
Module Leader	Ahmed Adnan Hadi	e-mail	a.algbory@kus.edu.iq
Module Leader’s Acad. Title	lecturer	Module Leader’s Qualification	Ph.D
Module Tutor	Osama Mohammed Noori	e-mail	osama20111989@kus.edu.iq
Peer Reviewer Name	/	e-mail	/
Scientific Committee Approval Date	30/6/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understand the fundamental concepts of data structures and their role in organizing and managing data efficiently. 2. Analyze algorithm performance using basic complexity analysis and Big-O notation. 3. Understand and apply linear data structures such as arrays, linked lists, stacks, and queues. 4. Explain advanced list structures including doubly linked lists and circular linked lists. 5. Understand tree structures, particularly binary search trees, and perform basic tree operations and traversals. 6. Describe advanced data structures such as heaps and hash tables and explain their practical applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the fundamental concepts of data structures and their importance in computer science. 2. Analyze algorithm efficiency using basic time complexity concepts and Big-O notation. 3. Implement and manipulate linear data structures such as arrays, linked lists, stacks, and queues. 4. Distinguish between different linked list structures including singly, doubly, and circular linked lists. 5. Apply tree-based structures such as binary search trees and perform basic traversal operations. 6. Describe and use advanced data structures such as heaps and hash tables for efficient data management.

Indicative Contents المحتويات الإرشادية	1. Basic concepts of data structures, importance of data organization, and the relationship between algorithms and data structures. 2. Basic concepts of algorithm efficiency, time complexity, space complexity, and Big-O notation. 3. Structure of arrays, indexing, traversal, insertion, deletion, and searching operations. 4. Concept of linked lists, node structure, singly linked lists, and basic operations 5. Stack structure, push and pop operations, and practical applications. 6. Queue structure, enqueue and dequeue operations, and types of queues. 7. Doubly linked lists and circular linked lists and their applications. 8. Tree structure, terminology (root, parent, child, leaf), and hierarchical data representation. 9. BST properties, insertion, searching, deletion, and tree traversal methods. 10. Min-Heap and Max-Heap concepts and applications in priority queues. 11. Hash functions, collision handling techniques, and applications. 12. Graph concepts, types of graphs, and graph representation methods. 13. Breadth-First Search (BFS) and Depth-First Search (DFS) algorithms and their applications.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures :The instructor explains the main concepts of the course using clear explanations, examples, and visual aids such as slides and diagrams. 2. Class Discussions :Students are encouraged to participate in discussions and share ideas to better understand the concepts. 3. Laboratory Activities :Students practice programming and implement data structures in the laboratory to apply what they learn in theory. 4. Questions and Feedback :Students are given opportunities to ask questions and receive immediate feedback from the instructor to clarify difficult topics.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Data Structures and Basic Concepts
Week 2	Algorithm Analysis and Big-O Notation
Week 3	Arrays: Structure, Operations, and Applications
Week 4	Linked Lists: Concept, Structure, and Basic Operations
Week 5	Stack Data Structure and its Applications
Week 6	Queue Data Structure and Types of Queues
Week 7	Advanced Linked Lists: Doubly Linked Lists and Circular Linked Lists
Week 8	Trees: Basic Concepts and Terminology

Week 9	Binary Search Trees (BST) and Tree Traversal Methods
Week 10	Heap Data Structure and Priority Queues
Week 11	Hash Tables and Hashing Techniques
Week 12	Graphs: Basic Concepts, Types of Graphs
Week 13	Graph Representation: Adjacency Matrix and Adjacency List
Week 14	Graph Traversal Algorithms: BFS and DFS
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to the lab environment and review of basic concepts used in data structures
Week 2	Writing simple programs to analyze algorithms and understand basic complexity concepts
Week 3	Implementing arrays and practicing operations such as insertion, deletion, and traversal
Week 4	Implementing singly linked lists and performing basic operations
Week 5	Implementing stack using arrays or linked lists and testing push and pop operations
Week 6	Implementing queue and practicing enqueue and dequeue operations
Week 7	Implementing doubly linked lists and circular linked lists
Week 8	Creating simple programs to represent and manipulate tree structures
Week 9	Implementing binary search trees (BST) and practicing traversal methods
Week 10	Implementing heap data structure and understanding priority queue operations
Week 11	Implementing hash tables and testing hashing functions
Week 12	Creating programs to represent graphs
Week 13	Implementing graph representation using adjacency matrix and adjacency list
Week 14	Implementing graph traversal algorithms (BFS and DFS) and testing them on sample graphs
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Recommended Texts	- Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. Introduction to Algorithms. MIT Press. - Weiss, M. A. Data Structures and Algorithm Analysis in C++. Pearson Education.	No
Websites	https://www.pearson.com/en-us/subject-catalog/p/data-structures-and-algorithm-analysis-in-c	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	English language 1		Module Delivery		
Module Type	B		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒ Seminar		
Module Code	KUS12011				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1			Semester of Delivery
Administering Department		AI & Robotics	College	College of engineering	
Module Leader	Lina Lutfi Rasheed		e-mail	Eng.linalutfi@kus.edu.iq	
Module Leader’s Acad. Title		Lecturer	Module Leader’s Qualification		Master degree
Module Tutor	Lina Lutfi Rasheed		e-mail	Eng.linalutfi@kus.edu.iq	
Peer Reviewer Name		/	e-mail	/	
Scientific Committee Approval Date		30/6/2026	Version Number	1	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To develop students' basic English language skills in reading, writing, listening, and speaking. 2. To improve students' grammar and vocabulary for academic and everyday communication. 3. To help students build confidence in speaking English in classroom discussions and presentations. 4. To enhance students' writing skills, including sentence structure, paragraph writing, and short compositions. 5. To introduce students to basic academic English needed for university study. 6. To encourage students to use English as a tool for communication and learning.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Use key English grammar structures such as present, past, and future forms in spoken and written communication. 2. Apply appropriate vocabulary and expressions related to everyday topics such as people, experiences, food, travel, and work. 3. Understand the main ideas and specific information in short to medium-length reading texts. 4. Listen to conversations and short talks and identify the general meaning and important details.
Indicative Contents المحتويات الإرشادية	1. Basic English communication skills, including introducing oneself, asking and answering questions, and participating in simple conversations in everyday situations. (10 Hours) 2. Study of essential grammar structures, such as present, past, and future tenses, modal verbs, comparative and superlative forms, and conditional sentences. (10 Hours) 3. Development of vocabulary related to everyday topics, including daily life, travel, food, work, hobbies, and relationships, to help learners communicate more effectively. (10 Hours) 4. Practice of the four language skills: listening, speaking, reading, and writing through various classroom activities and exercises. (10 Hours) 5. Improvement of pronunciation and fluency through dialogues, listening tasks, and speaking practice. (10 Hours)

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

1. Interactive Lectures: Presenting grammar, vocabulary, and language functions through explanations and guided practice.
2. Communicative Language Teaching: Encouraging students to use English actively through pair work, group discussions, and role-plays.
3. Task-Based Activities: Using tasks from the course book to practice real-life communication skills.
4. Listening and Reading Practice: Developing comprehension skills through audio materials and reading passages.
5. Writing Practice: Guiding students to produce sentences, paragraphs, and short texts using correct grammar and vocabulary.
6. Classroom Discussions: Encouraging students to express opinions, ask questions, and participate in conversations.
7. Use of Multimedia: Supporting learning through audio recordings, videos, and digital resources.

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 12	LO #1, #2, #3 and #8, #9, #10
	Assignments	2	10% (10)	6 and 10	LO #4, #5 and #6, #7
	Homework	1	10% (10)	12	LO #11
	Seminar	1	10% (10)	13	LO #12
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All

Total assessment	100% (100 Marks)		
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Delivery Plan (Weekly Syllabus) المناهج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to English Communication
Week 2	Present Tenses
Week 3	Past Tenses
Week 4	Vocabulary Development
Week 5	Quantities and Articles
Week 6	Talking about the Future
Week 7	Present Perfect
Week 8	Comparatives and Superlatives
Week 9	Modals and Advice
Week 10	Narrative and Storytelling
Week 11	Conditional Sentences
Week 12	Integrated Skills Practice
Week 13	Integrated Skills Practice
Week 14	Integrated Skills Practice
Week 15	Preparation for the final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1- Headway Pre-Intermediate Student's Book (5th Edition) – by Liz Soars, John Soars, and Paul Hancock. Published by Oxford University Press, 2018/2019. ISBN: 978-0194527699	yes

Recommended Texts		
Websites	Headway: Pre-intermediate Student's Book with Online Practice - Liz Soars, John Soars, Paul Hancock - كتب Google	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	
(5) ساعة	● تهيئة العرض التقديمي (عرض تقديمي للطلاب)
(7) ساعة	● واجبات (حل وانجاز واجبات الطلبة)
(5) ساعة	● التهيئة لامتحان النهائي
(17) ساعة	المجموع

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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Mathematics		Module Delivery		
Module Type	Basic learning activities		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	KUS11001				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		first	Semester of Delivery		1
Administering Department		AI & Robotics	College	Engineering	
Module Leader	Lina Lutfi Rasheed		e-mail	Eng.linalutfi@kus.edu.iq	
Module Leader's Acad. Title		Assistant Lecturer	Module Leader's Qualification		MSc.`
Module Tutor			e-mail	Eng.linalutfi@kus.edu.iq	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To provide a solid foundation in the principles and methods of integral calculus. 2. To develop students' ability to compute indefinite and definite integrals of various functions. 3. To introduce advanced integration techniques and demonstrate their practical uses. 4. To enhance logical and analytical reasoning in mathematical problem solving. 5. To apply integration to real-life problems in geometry, physics, and related fields. 6. To encourage accuracy, clarity, and systematic approaches in mathematical computation. 7. To prepare students for further studies that require calculus-based analysis and modeling.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define and explain the concept of integration as the inverse of differentiation. 2. Solve indefinite integrals of algebraic, trigonometric, exponential, and logarithmic functions. 3. Apply integration techniques such as substitution, integration by parts, trigonometric substitution, and partial fractions. 4. Evaluate definite and improper integrals using analytical methods. 5. Interpret and apply integration to compute areas, volumes, and physical quantities. 6. Analyze convergence or divergence in improper integrals and justify solutions logically. 7. Demonstrate independent problem-solving skills through structured reasoning and verification of results. 8. Use mathematical notation and procedures effectively to communicate solutions and reasoning.
Indicative Contents المحتويات الإرشادية	Part A – Fundamental Concepts of Integration Definition and meaning of integration as the reverse of differentiation. Indefinite integrals of basic algebraic functions. Integration rules, substitution of variables, and standard forms. [10 hrs] Part B – Integration of Trigonometric and Transcendental Functions Integration of trigonometric, exponential, and logarithmic functions. Relationships between trigonometric identities and integrals. Special trigonometric substitutions and simplification techniques. [10 hrs] Part C – Techniques of Integration Integration by parts and reduction formulas.

	Integration by trigonometric substitution and completing the square. Integration by substitution and by partial fractions. Strategic selection of integration methods for complex expressions. [22 hrs] Part D – Applications of Integration Definite and improper integrals. Geometric applications: area under curves, area between curves, and volumes of revolution. Applications in physics, biology, and economics (work, accumulation, averages, and growth models). [15 hrs] Revision and Problem-Solving Sessions Review of key integration methods and formula recall. Mixed problem-solving and exam practice. Conceptual consolidation and guidance on common mistakes. [5 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Providing students with basic mathematical concepts and their practical applications. 2. Forming discussion groups during lectures to discuss mathematics topics and solve practical problems. 3. Giving students homework that requires self-explanations in different ways. 4. Solving problems relevant with mathematical subject.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	20% (20)	5-10	Lec. #2,#4,#6,#8,#10
	Assignments	1	10% (10)	2-12	Lec. #1, #3,#5,#7,#9,#11
	Projects	0	0	0	All
	Reports	1	10% (10)	2-13	All
Summative assessment	Midterm Exam	2hr	10% (10)	7	Lec. #1-#8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	Completing the Square & Substitution Methods
Week 2	Definite Integrals & Area Under Curves
Week 3	Improper Integrals & Convergence
Week 4	Indefinite Integrals of Algebraic Functions
Week 5	Integration by Parts – Advanced Problems
Week 6	Integration by Parts – Concepts and Examples
Week 7	Integration of Advanced Trigonometric Functions
Week 8	Integration of Exponential Functions

Week 9	Integration of Logarithmic Functions
Week 10	Integration of Simple Trigonometric Functions
Week 11	Introduction to Integration & Basic Algebraic Integrals
Week 12	Partial Fraction Decomposition
Week 13	Revision and Problem-Solving
Week 14	Trigonometric Substitution Techniques
Week 15	Volumes of Revolution & Applications

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Thomas' calculus 11 ed. 2004	yes
Recommended Texts	1. Calculus 9 th edition, Anton	yes
Websites	https://mediasace.utah.edu/media/t/0_2eoc2ksc	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fundamentals of Computer Science		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar
Module Code	KUS11002		
ECTS Credits	3		
SWL (hr/sem)	48		
Module Level	1	Semester of Delivery	
Administering Department	AI and robotics	College	1
Module Leader	Ahmed Adnan	e-mail	College of Engineering
Module Leader’s Acad. Title	lecturer	Module Leader’s Qualification	a.algbory@kus.edu.iq
Module Tutor	Osama Mohammed Noori	e-mail	Ph.D
Peer Reviewer Name	/	e-mail	osama20111989@kus.edu.iq
Scientific Committee Approval Date	30/6/2026	Version Number	/
			1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Introduce students to basic computer concepts including hardware, software, and data representation. 2. Provide understanding of the operating system and graphical user interface operations. 3. Develop basic word processing, spreadsheet, and presentation software skills. 4. Introduce the fundamentals of Internet, web browsing, and electronic communication. 5. Provide knowledge of cloud computing and modern digital collaboration tools. 6. Provide knowledge of programming using python language.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand computer hardware components and their functions. 2. Operate common operating systems and navigate through graphical user interfaces. 3. Create and edit documents using word processing software. 4. Design and manage spreadsheets using formulas and functions. 5. Develop and present professional presentations using presentation software. 6. Access and utilize the Internet effectively using web browsers and search engines. 7. Communicate through email and collaborate using cloud-based services. 8. Apply basic cybersecurity and digital ethics principles in computer usage. 9. Program basic codes and make GUIs.
Indicative Contents المحتويات الإرشادية	• Introduction to Computer Concepts Basic definitions, components of a computer, hardware and software overview. [3 hrs] • Computer Components CPU, memory, storage devices, input/output units, and peripheral components. [4 hrs] • Operating Systems and GUI Types of operating systems, basic commands, and file management operations.[4 hrs] • Word Processing Software Creating, formatting, and editing documents using Microsoft Word. [4 hrs] • Spreadsheet Software Data entry, formulas, charts, and functions using Microsoft Excel. [5 hrs] • Presentation Software Slide design, themes, transitions, and multimedia using PowerPoint. [3 hrs]

	• Internet and Web Browsers LAN/WAN basics, web browsing, search engines, and data access. [4 hrs] • Communication Tools Email systems, online collaboration, and cloud-based communication. [3 hrs] • Cloud Computing and Services Google Workspace, Office 365, and cloud storage usage. [3 hrs] • Introduction to Python Programming Installing Python and PyCharm, basic syntax, and simple program execution. [4 hrs] • Python Programming Structures Variables, conditions, loops, lists, and basic functions.[4 hrs] • Basic AI Concepts Introduction to AI, types of AI, basics of machine learning, real-world applications. [4 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Lecture: Deliver core concepts using visual presentations, demonstrations, and structured explanations. • Discussion: Encourage student interaction, idea exchange, and clarification of concepts through guided discussions. • Practical Experience: Apply theoretical knowledge through hands-on lab activities, software tasks, and real-world exercises. • Clarification and Questions: Provide opportunities for students to ask questions, seek clarification, and receive immediate feedback. • Reflection: Support student reflection on learned concepts to reinforce understanding and connect theory to practice. • Research and Reports: Promote independent learning through small research tasks, report writing, and exploration of additional resources.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem)	12	Unstructured SWL (h/w)	1.8

الحمل الدراسي غير المنتظم للطالب خلال الفصل	الحمل الدراسي غير المنتظم للطالب أسبوعيا
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Computer Concepts – Definition of computer, hardware, software, and data representation.
Week 2	Computer Components – CPU, memory, storage, input/output devices, and peripherals.
Week 3	Operating Systems and GUI – Types of operating systems, desktop environment, and file management.
Week 4	Word Processing Software – Creating, formatting, and editing documents using Microsoft Word.
Week 5	Spreadsheet Software – Data entry, formulas, charts, and data analysis using Microsoft Excel.
Week 6	Presentation Software – Slide design, themes, transitions, and multimedia using PowerPoint.
Week 7	Internet and Web Browsers – LAN/WAN basics, search engines, and safe browsing.
Week 8	Communication Tools – Email systems, online collaboration, and digital communication ethics.
Week 9	Cloud Computing and Services – Google Workspace, Office 365, and cloud storage applications.
Week 10	Introduction to Python Programming – Installing Python and PyCharm, understanding syntax and variables.
Week 11	Python Programming Basics – Data types, input/output, and simple calculations.

Week 12	Python Control Structures – Conditional statements and loops.
Week 13	Python Data Structures – Lists, strings, and basic operations.
Week 14	Basic AI Concepts – Introduction to AI, applications in daily life, and examples in Python.
Week 15	Review and Final Preparation – Revision of all topics before final exam.

Delivery Plan (Weekly Lab. Syllabus) المناهج الاسبوعي للمختبر	
	Material Covered
Week 1	EXP 1: Exploring Computer Hardware and Operating Systems
Week 2	EXP 2: Troubleshooting and System Utilities
Week 3	EXP 3: Using Microsoft Word – Document Creation and Formatting
Week 4	EXP 4: Using Microsoft Excel – Data Entry, Formulas, and Charts
Week 5	EXP 5: Using Microsoft PowerPoint – Slide Design and Presentation
Week 6	EXP 6: Installing Python and Setting Up PyCharm Environment
Week 7	EXP 7: Python Basics – Variables, Data Types, and Input/Output
Week 8	EXP 8: Conditional Statements – if, else, and nested if
Week 9	EXP 9: Loops – for and while structures
Week 10	EXP 10: Lists and Strings – Basic Operations and Manipulation
Week 11	EXP 11: Functions – Definition, Parameters, and Return Values
Week 12	EXP 12: Simple Networking and Internet Use
Week 13	EXP 13: File Handling in Python – Read and Write Operations
Week 14	EXP 14: Mini Project – Creating a Simple Calculator or Grade Sheet using Python and Excel
Week 15	EXP 15: Final Practical Assessment – Review of Word, Excel, and Python Applications

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Brookshear, J. Glenn, Dennis Brylow, and S. Manasa. "Computer science: An overview." (2009).	Yes
Recommended Texts	Patterson, David A., and John L. Hennessy. Computer organization and design ARM edition: the hardware software interface. Morgan kaufmann, 2016.	No

	Petzold, Charles. Code: The hidden language of computer hardware and software. Microsoft Press, 2000.	
Websites	Computer Science YouTube Channels: Channels like "Computerphile," Computer Science," and "MIT Open Courseware.	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	اللغة العربية	Module Delivery	
Module Type	B	☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	KUS12010		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1		
Administering Department	AI & Robotics	College	College of Engineering
Module Leader	أ.م.د. مثنى محمد عبدالحسين	e-mail	mohana@kus.edu.iq
Module Leader's Acad. Title		Module Leader's Qualification	Ph.D
Module Tutor		e-mail	
Peer Reviewer Name	لا يوجد	e-mail	لا يوجد

Scientific Committee Approval Date	30/6/2026	Version Number	1.0
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Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ترتبط اللغة العربية وفروعها المتعددة مع الاختصاصات الأخرى بصلة جوهرية ، لان الفروع جميعها متعاونة لتحقيق الغرض الأصلي منها ، وهو تمكين المتعلم من استخدام اللغة استخداما صحيحا للأفهام والفهم	Semester	
Co-requisites module	لصلتها الأساسية في توجيه الطالب لكتابة التقارير والبحوث بلغة سليمة ومختصرة تؤدي الى انجاز بحوث هادفة ومكتملة المعنى	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسي ة	تقويم اللسان تهيئة الازهان - اللفظ بشكل سليم تنمية مهارات صياغة الكتب والمخاطبات الرسمية - اعداد البحوث والتقارير بشكل سليم
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	مخرجات المعرفة العامة التي تتمثل (التعرف إلى مستويات نظام اللغة العربية - معرفة القواعد النحوية والصرفية - وصف المناهج النقدية والظواهر الأدبية - التعريف بأبرز المصنفات اللغوية والأدبية) بالإضافة الى المهارات الذهنية الإدراكية(- المهارات العملية أو المهنية - المهارات المنقولة/ العامة - مهارات الاتصال، وتقنية المعلومات -الاتجاهات والقيم والبعد الأخلاقي)
Indicative Contents المحتويات الإرشادية	تعد علاقة الإرشاد بالتربية علاقة تكامل، فلا يمكن التفكير بالتربية بدون الإرشاد وتعد المؤسسات التربوية المجال الحيوي الفعال للإرشاد، إذ أن هذه الاخيرة في أمس الحاجة إلى خدماته وذلك بسبب الفروقات الفردية ب زي الطلاب، اختلاف المناهج، ازدياد عدد الطلبة، ازدياد المشكلات الاجتماعية

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		33 ساعة	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		17 ساعة	
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	أجهزة الصوت – شاشة العرض -اللاب توب -المنهج المقرر – أمثلة حية		

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50 ساعة
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Module تقييم المادة الدراسي Evaluation					
As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	5% (5)	5	فهم الطالب لعدد من المحاضرات وكيفية الربط بينهم
	Assignments	1	5% (5)	3	اكتساب الطالب مهارة البحث وإيجاد المعلومة الدقيقة
	Projects / Lab.	1	10% (10)	لا يوجد	لا يوجد

	Report	1	10% (10)	10	تهيئة الطالب لإعداد مشاريع تخرج بصورة صحيحة وبشكل مفصل وتعليمه على كيفية استخدام المصادر
Summative assessment	Midterm Exam	2hr	20% (2)	9	معرفة حصيلة فهم الطالب للمادة
	Final Exam	3hr	60% (6)	16	التقييم النهائي
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
Week	Material Covered
Week 1	التعريف بمبادئ اللغة العربية وأهميتها وأقسامها وكيفية توظيفها في مجالات الحياة كافة
Week 2	التمييز بين همزة الوصل وهمزة القطع وكيفية ضبط النص املائيًا
Week 3	العدد والمعدود وأقسامه وتوظيفه عمليًا
Week 4	علامات اليمين وكيفية تنقيط النص للوصول إلى جمل مترابطة في سياقها
Week 5	الإيجاز في الإداء اللغوي وتكثيف المعنى
Week 6	محاضرة نحوية في الفاعل ونائبه
Week 7	الأغلاط اللغوية الشائعة وكيفية تصحيحها
Week 8	موازنة بين عصرين شعريين وأبرز شعرائه
Week 9	Midterm exam
Week 10	الأسس العلمية والمنهجية في كتابة التقارير بأنواعها وتوظيفها عمليًا
Week 11	كيفية تصحيح الكتب الرسمية وربط مضمون السياق النصي
Week 12	محاضرة في الأدب العربي وتسلط الضوء على أقسامه وتفصيلاتها
Week 13	التوكيد وأنواعه وأصول توظيفه نصيًا
Week 14	محاضرة نحوية في التقديم والتأخير
Week 15	دروس عملية في تطبيق القواعد النحوية والإملائية وتصحيح النصوص
Week 16	Second Midterm Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	اللغة العربية العامة لأقسام غ ي الاختصاص – عبد القادر حسن امين	نعم
Recommended Texts	رؤية في مناهج تدريس اللغة العربية – استاذ الدكتور سعد علي زاير + العربية الجامعية لغير المتخصصين – دكتور عبد الراحي	نعم
Websites	تم الاعتماد على كتب من دون استخدام الانترنت	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 -)001	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-)94	More work required but credit awarded
	F – Fail	راس ب	(0-)44	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Democracy and Human Rights			Module Delivery	
Module Type	Basic learning			☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	KUS11003				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	Semester of Delivery		
Administering Department		AI & Robotics	College	Engineering	
Module Leader	Wafaa Abdul-hussein Kadhim			e-mail	Wafaa.hussein90@kus.edu.iq
Module Leader's Acad. Title			Module Leader's Qualification		
Module Tutor				e-mail	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. تعريف الطلاب بمفهوم حقوق الإنسان وطبيعتها. 2. فهم التطور التاريخي لحقوق الإنسان عبر العصور. 3. التمييز بين حقوق الإنسان والحقوق الأخرى. 4. دراسة حقوق الإنسان في الديانات السماوية وتأثيرها على المجتمع. 5. التعرف على الحقوق الإنسانية في المواثيق والمعاهدات الدولية. 6. فهم دور التشريعات الوطنية في حماية حقوق الإنسان. 7. التعرف على نشوء المنظمات غير الحكومية وأعرافها بحقوق الإنسان. 8. التعرف على مفهوم الديمقراطية. 9. التعرف على مفهوم الحريات وأنواعها. 10. المواطنة في التشريعات والقوانين المختلفة.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. تعريف حقوق الإنسان وتحديد خصائصها الأساسية. 2. شرح التطور التاريخي لحقوق الإنسان. 3. التمييز بين حقوق الإنسان والحقوق الأخرى في المجتمع. 4. توضيح موقف حقوق الإنسان في الديانات السماوية. 5. وصف الحقوق الإنسانية في المواثيق الدولية والمعاهدات. 6. تحليل التشريعات الوطنية لحماية الحقوق الإنسانية. 7- التعرف على نشوء المنظمات غير الحكومية وأعرافها بحقوق الإنسان. 8- التعرف على مفهوم الديمقراطية. 9- التعرف على مفهوم الحريات وأنواعها. 10- المواطنة في التشريعات والقوانين المختلفة.
Indicative Contents المحتويات الإرشادية	• مقدمة في حقوق الإنسان: تعريف حقوق الإنسان، طبيعتها، والمبادئ الأساسية التي تقوم عليها. [3 ساعات] • التطور التاريخي لحقوق الإنسان: مراحل تطور حقوق الإنسان عبر العصور القديمة والوسطى والحديثة. [3 ساعات] • خصائص حقوق الإنسان: السمات الأساسية التي تميز حقوق الإنسان عن غيرها من الحقوق. [3 ساعات]

	• حقوق الإنسان في الديانات السماوية: مكانة حقوق الإنسان في الشرائع السماوية وتأثيرها في المجتمعات. [3 ساعات] • الحقوق الإنسانية في المواثيق الدولية: دراسة أهم الاتفاقيات والإعلانات الدولية المتعلقة بحقوق الإنسان. [3 ساعات] • حقوق الإنسان في التشريعات الوطنية: حماية حقوق الإنسان في الدساتير والقوانين الوطنية. [3 ساعات] • أنواع حقوق الإنسان: الحقوق المدنية والسياسية والاقتصادية والاجتماعية والثقافية. [3 ساعات] • ضمانات حقوق الإنسان: الضمانات الداخلية والدولية التي تكفل حماية حقوق الإنسان. [3 ساعات] • الجزاءات المترتبة على انتهاك حقوق الإنسان: النتائج القانونية والأخلاقية المترتبة على المساس بحقوق الإنسان. [3 ساعات] • المنظمات غير الحكومية (NGOs): نشوؤها ودورها في الدفاع عن حقوق الإنسان والاعتراف الدولي بها. [3 ساعات] • مفهوم الديمقراطية: تعريف الديمقراطية، مبادئها، وعلاقتها بحقوق الإنسان. [3 ساعات] • مفهوم الحريات: أنواع الحريات وأهميتها في المجتمع الديمقراطي. [3 ساعات] • المواطنة: مفهومها، حقوق المواطن وواجباته، وعلاقتها بالهوية الوطنية. [2 ساعات]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	نعمد في هذا الجانب إلى ما يلي: 1- المحاضرة 2- المناقشة 3- الصف المقلوب 4- دراسة الحالة

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / tutorial.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المناهج الاسبوعي النظري	
	Material Covered
Week 1	التعريف بطبيعة حقوق الإنسان
Week 2	التطور التاريخي لحقوق الإنسان
Week 3	مميزات حقوق الإنسان عن غيرها من الحقوق
Week 4	حقوق الإنسان في الديانات السماوية
Week 5	حقوق الإنسان في المواثيق الدولية
Week 6	حقوق الإنسان في التشريعات الداخلية
Week 7	حقوق الإنسان الشخصية والاجتماعية والثقافية والاقتصادية
Week 8	ضمانات حقوق الإنسان الدولية
Week 9	ضمانات حقوق الإنسان الداخلية (الوطنية)
Week 10	الجزاء المترتبة على المساس بحقوق الإنسان
Week 11	نشوء المنظمات غير الحكومية وأعرافها بحقوق الإنسان
Week 12	مفهوم الديمقراطية
Week 13	مفهوم الحريات وأنواعها
Week 14	المواطنة في التشريعات والقوانين المختلفة
Week 15	امتحان

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	كتاب/ حقوق الانسان (تطورها، مضامينها، حمايتها) د. رياض عزيز هادي.	Yes
Recommended Texts	كتاب/ حقوق الانسان د. حميد حنون.	No
Websites	https://www.noor-book.com/ https://www.un.org/ar/about-us/universal-declaration-of-human-rights https://ar.wikipedia.org/wiki/	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Fundamentals of Engineering Mathematics			Module Delivery	
Module Type	B			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	AIR12008				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		1	Semester of Delivery		2
Administering Department		AI & Robotics	College	Engineering	
Module Leader	Dr. Aws Khalid Ibrahim		e-mail	aws.khalid@kus.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D
Module Tutor	Dr. Aws Khalid Ibrahim		e-mail	aws.khalid@kus.edu.iq	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1) Provide students with the essential mathematical foundations required for engineering studies. 2) Develop students' ability to manipulate algebraic, trigonometric, and logarithmic expressions used in engineering analysis. 3) Introduce fundamental concepts of matrices, vectors, and complex numbers and their applications in engineering problems. 4) Enable students to solve systems of linear equations using matrix methods. 5) Introduce students to partial differentiation and differential equations used in engineering modeling. 6) Familiarize students with Laplace transforms as a mathematical tool for solving differential equations. 7) Strengthen analytical thinking and problem-solving skills relevant to engineering, robotics, and intelligent systems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Apply algebraic techniques and manipulate exponential and logarithmic functions in engineering problems. 2) Analyze and solve problems involving trigonometric and hyperbolic functions. 3) Decompose rational functions using partial fractions. 4) Perform operations with complex numbers and represent them in different forms. 5) Perform matrix operations and use matrices to solve systems of linear equations. 6) Determine determinants, inverses, eigenvalues, and eigenvectors of matrices. 7) Apply vector algebra including scalar and vector products in engineering applications. 8) Solve problems involving partial differentiation. 9) Solve first-order and second-order differential equations. 10) Apply Laplace transforms to basic engineering problems. 11) Use mathematical reasoning to model and analyze engineering systems.
Indicative Contents المحتويات الإرشادية	1. Logarithmic, Trigonometric and Hyperbolic Function: Exponential functions, Logarithmic functions, Trigonometric identities, Trigonometric equations, Hyperbolic functions and their properties 3. Partial Fractions and Complex Numbers: Decomposition of rational functions, Applications in engineering mathematics, Algebraic form of complex numbers, Polar representation, Basic operations on complex numbers 5. Matrices and Vectors: Matrix addition and subtraction, Matrix multiplication, Transpose of a matrix, Special matrices, Determinant of a square matrix, Inverse of a matrix, Solution of linear systems, Eigenvalues and

	eigenvectors, Components of vectors, Unit vectors, Vectors in space, Direction cosines, Scalar product, Vector product, Angle between two vectors 7. Differentiation and Laplace Transforms: Partial derivatives, Applications in engineering problems, First-order differential equations, Second-order differential equations, Introduction to Laplace transforms, Basic Laplace transform techniques
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures: Presentation of theoretical concepts and mathematical foundations. Tutorial Sessions: Step-by-step analytical solutions of representative examples. Interactive Learning : Classroom discussions and student participation in solving problems. Practice Exercises : Regular assignments to reinforce understanding of mathematical concepts. Visual and Graphical Illustrations : Use of diagrams, graphs, and mathematical visualization to explain concepts. Application-Based Learning: Demonstrating engineering applications related to robotics, artificial intelligence, and engineering systems. Review Sessions: Periodic revision of key topics and preparation for examinations.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	1	10% (10)	2 and 12	LO #3, #4 and #6, #7

	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Algebra review, exponential and logarithmic functions
Week 2	Trigonometric and Hyperbolic Functions
Week 3	Partial fractions
Week 4	Complex numbers
Week 5	Matrices: Addition, Subtraction, Multiplication, Transpose, and special matrices
Week 6	Matrices: Determinant and Inverse of a Square Matrix
Week 7	Matrices: Solution of Linear Equations
Week 8	Matrices: Eigenvalues and Eigenvectors
Week 9	Vectors: Component of a Vector, Unit Vectors, Vectors in Space, and Direction Cosines.
Week 10	Vectors: Scalar Product, Vector Product, and Angle between Two Vectors.
Week 11	Partial Differentiation
Week 12	First-Order Differential Equations
Week 13	Second-Order Differential Equations
Week 14	Introduction to Laplace Transforms
Week 15	Review and Final Exam Preparation • Comprehensive course review and revision.

Delivery Plan (Weekly Tutorial Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Tutorial in exponential and logarithmic functions
Week 2	Problems in Trigonometric and Hyperbolic Functions
Week 3	Tutorial in Partial fractions
Week 4	Tutorial in Complex numbers
Week 5	Problems in Matrices (Addition, Subtraction, Multiplication, Transpose, and special matrices)
Week 6	Tutorial in Matrices (Determinant and Inverse of a Square Matrix)
Week 7	Problems in Matrices (Solution of Linear Equations)
Week 8	Tutorial in Matrices (Eigenvalues and Eigenvectors)
Week 9	Tutorial in Vectors (Component of a Vector, Unit Vectors, Vectors in Space, and Direction Cosines)
Week 10	Problems in Vectors (Scalar Product, Vector Product, and Angle between Two Vectors)
Week 11	Tutorial in Partial Differentiation
Week 12	Tutorial in First-Order Differential Equations
Week 13	Tutorial in Second-Order Differential Equations
Week 14	Problems in Laplace Transforms
Week 15	Review and Final Exam Preparation • Comprehensive course review and revision.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
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Required Texts	Engineering Mathematics by K.A. Stroud, 7 th edition.	yes
Recommended Texts	1. Advanced Engineering Mathematics – Erwin Kreyszig, 10 th edition. 2. Linear Algebra and Its Applications – Gilbert Strang, 4 th edition.	No
Websites	https://www.mathforengineers.com/	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.				

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Workshops			Module Delivery	
Module Type	S			☐ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	AIR12013				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		1	Semester of Delivery		2
Administering Department		AI & Robotics	College	College of Eng.	
Module Leader	Layth Majid Jalil		e-mail	laythmajid@kus.edu.iq	
Module Leader’s Acad. Title		Lecturer	Module Leader’s Qualification		M.Sc
Module Tutor	Layth Majid Jalil		e-mail	laythmajid@kus.edu.iq	
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Provide students with the fundamental technical knowledge and skills in workshop to recognize, analyze and solve problems, and to apply these abilities to the generation of new knowledge, ideas or products in industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explain the use of measuring and bench fitting tools. • Show the use of safety equipment during workshop practice. • Knowledge and understanding the use of different tools. • Describe the basic concepts of different types of welding. • Display the ability to use different basic machining operations keeping all safety precautions in mind.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	48	Structured SWL (h/w)	3
Unstructured SWL (h/sem)	27	Unstructured SWL (h/w)	2
Total SWL (h/sem)	75		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	5% (5)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	11	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2hr	20% (20)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Principles of safety in workshop and laboratories
Week 2	Machining process
Week 3	Machining process
Week 4	Sheet metal forming
Week 5	Sheet metal forming
Week 6	Welding process
Week 7	Welding process
Week 8	Mid 1 Examine
Week 9	Electricity
Week 10	Electricity
Week 11	Machining process
Week 12	Machining process
Week 13	Carpentry
Week 14	Carpentry
Week 15	Mid 2 Examine
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

	Ministry of Higher Education and Scientific Research - Iraq AL-Karkh University of Science Engineering Department of AI and Robotics	
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information					
معلومات المادة الدراسية					
Module Title	Chemistry			Module Delivery	
Module Type	Basic			☐ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practica I ☐ Seminar	
Module Code	AIR12012				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		1	Semester of Delivery		2
Administering Department		AI & Robotics	College	Engineering	
Module Leader	Fadhil Muhi Mohammed		e-mail	fadhil.mohammed@kus.edu.iq	
Module Leader’s Acad. Title		Assist. Prof.	Module Leader’s Qualification		PhD
Module Tutor			e-mail		
Peer Reviewer Name			e-mail		
Scientific Committee Approval Date		30/6/2026	Version Number		1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To provide students with a solid foundation in fundamental chemistry concepts. 2. To develop understanding of atomic structure, chemical bonding, and molecular interactions. 3. To teach quantitative chemical analysis and stoichiometry for practical problem solving. 4. To introduce thermodynamics and kinetics to explain chemical behavior. 5. To explain acid-base chemistry, solutions, and electrochemistry. 6. To provide an introduction to organic chemistry and materials relevant to engineering applications. 7. To link chemistry principles to materials, sensors, and electronic devices for AI & Robotics applications. 8. To develop practical problem-solving skills and analytical thinking in chemistry contexts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain atomic structure, periodic trends, and chemical bonding. 2. Predict molecular geometry and intermolecular interactions. 3. Perform stoichiometric calculations and solve quantitative chemical problems. 4. Apply thermodynamics and kinetics concepts to explain chemical reactions. 5. Analyze acid-base equilibria, pH, and solution chemistry problems. 6. Explain redox reactions and basic electrochemical concepts. 7. Describe basic organic compounds and functional groups relevant to engineering materials. 8. Understand polymers, corrosion, and material chemistry. 9. Understand sensor materials, batteries, and electronic chemistry. 10. Demonstrate problem-solving skills and apply chemistry concepts to real-world engineering contexts.
Indicative Contents المحتويات الإرشادية	Foundations of Chemistry This section introduces students to basic chemistry concepts including measurement units, the scientific method, and laboratory safety. Atomic structure, isotopes, and electronic configuration are explained, followed by an overview of the periodic table and periodic trends. These fundamentals are essential for understanding subsequent chemical behavior. [6 hrs] Chemical Bonding and Molecular Structure

	Students study ionic, covalent, and metallic bonds, along with Lewis structures and formal charges. Molecular geometry, VSEPR theory, and intermolecular forces are discussed to explain physical and chemical properties of substances. Special emphasis is placed on bonds and interactions relevant to engineering materials. [8 hrs] Stoichiometry and Chemical Calculations Topics include the mole concept, balancing chemical equations, limiting reactants, and yield calculations. Practical problem-solving exercises prepare students for analyzing real-world chemical reactions and materials processing. [6 hrs] Thermodynamics and Kinetics This section covers energy changes in chemical reactions, enthalpy, entropy, Gibbs free energy, reaction rates, and factors affecting reaction kinetics. Students learn how these principles govern material stability and reaction feasibility in engineering applications. [8 hrs] Acids, Bases, and Solutions Students explore the Brønsted-Lowry and Lewis definitions, pH calculations, buffer solutions, and solubility equilibria. Applications include concrete chemistry for Civil Engineering and electrolyte solutions for AI & Robotics devices. [6 hrs] Electrochemistry and Redox Reactions This section introduces oxidation-reduction reactions, electrochemical cells, standard potentials, and Faraday's laws. Applications include corrosion prevention, batteries, and sensor materials. [6 hrs] Organic Chemistry and Functional Materials Basic organic chemistry is introduced, including hydrocarbons, alcohols, and functional groups. Emphasis is on polymers, composites, and electronic materials relevant to Civil Engineering and AI & Robotics. [8 hrs] Material Chemistry in Engineering Applications This section focuses on topics include sensor materials, batteries, semiconductors, and polymeric devices. Interdisciplinary examples illustrate the connection between chemistry principles and engineering design For AI & Robotics,. [10 hrs] Revision and Problem-Solving Students consolidate knowledge across all topics through exercises and real-world engineering problems. The session emphasizes practical application, critical thinking, and interdisciplinary connections. [4 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some interesting for example sampling activities for the students. As well as by assigning students to make seminars on a specific topic in chemistry.
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5,10	1,2 and 10
	Assignments	2	10% (10)	2,12	3,4,6,and 7
	Projects / Lab.	1	10% (10)	Continues	
	Report	1	10% (10)	13	5,8,and 10
Summative assessment	Midterm Exam	2hr	10% (10)	7	1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Chemistry: Basic Concepts and Measurements
Week 2	Atomic Structure and the Periodic Table
Week 3	Chemical Bonding: Ionic, Covalent, and Metallic Bonds
Week 4	Molecular Geometry and Intermolecular Forces
Week 5	Stoichiometry and Chemical Calculations
Week 6	Chemical Thermodynamics: Energy, Enthalpy, and Entropy
Week 7	Chemical Kinetics and Reaction Rates
Week 8	Acids, Bases, and pH Concepts
Week 9	Solutions, Concentrations, and Solubility
Week 10	Oxidation-Reduction Reactions and Electrochemistry
Week 11	Organic Chemistry Basics: Hydrocarbons and Functional Groups
Week 12	States of matter
Week 13	Material chemistry
Week 14	Green chemistry and sustainability
Week 15	Buffer solution
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Laboratory safety and introduction to laboratory techniques and measurements
Week 2	Preparation of standard solutions from solid materials
Week 3	Preparation of standard solution from liquid reagents
Week 4	Titration strong acid with a strong base
Week 5	Titration of Sodium Carbonate with Hydrochloric Acid
Week 6	pH-metric titration
Week 7	Conductometric Titration of a Strong Acid with a Strong Base
Week 8	Conductivity measurement of electrolyte solutions

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Principles of Inorganic Chemistry, 2nd Edition Brian W. Pfennig December 2021 Principles of Organic Chemistry 1st Edition - January 27, 2015	No
Recommended Texts	Principles of Instrumental Analysis, 7E by Douglas A. Skoog/F. James Holler/Stanley R. Crouch , 2020 Chemical Principles, The Quest for KInsight, Third Edition, by Peter Atkins and Lorestta Jones, 2005	No
Websites	https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science .	

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.